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ABSTRACT

Presented is an annotated bibliography, arranged alphabetically by author (first author, if more than one), of research-based documents on the teaching and learning of science. Documents included represent research findings and theoretical views of educational researchers and practitioners; many report and analyze research outcomes and discuss their implications for classroom instruction, school administration, or teacher education. Each entry includes author(s), title, abstract, availability, accession number, order number (EJ and ED numbers for ERIC documents when applicable), and list of descriptors. These descriptors serve as guides to an index section where related documents are listed. This section categorizes documents by author and accession number using ERIC descriptors. (JN)

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SCIENCE EDUCATION RESOURCES

An Annotated Bibliography

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Appalachia Educational Laboratory
R&D Interpretation Service

SE 043 676

SCIENCE EDUCATION RESOURCES

An Annotated Bibliography

Research and Development
Interpretation Service

Appalachia Educational Laboratory

November 1983

Appalachia Educational Laboratory, Inc.
Post Office Box 1348
Charleston, West Virginia 25325

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FOREWORD

Science Education Resources: An Annotated Bibliography is a collection of abstracts of research-based documents about the teaching and learning of science.

The resources included in the bibliography have been collected by the Research and Development Interpretation Service (RDIS) during the past seven months. The documents reflect the most recent research conducted in the field of science education. Publication dates of most works are from the late 1970's through 1983.

The materials we reviewed and abstracted represent research findings and theoretical views of educational researchers and practitioners. All are research-based; many report and analyze research outcomes and discuss their implications for classroom instruction, school administration, or teacher education.

The bibliography can be a useful tool for locating recent research in science education. The document contains both abstracts and a topical index. The abstracts are arranged in alphabetical order, by author (first author, if more than one). The index categorizes documents by ERIC descriptors. These descriptors are also included on each abstract page.

The bibliography may be used to locate the research of a particular author by looking through the abstracts or to locate research in a particular area by looking first through the topical index. The bibliography may also be used to find out more about a particular topic. If, after reading an abstract, the reader wants more information on that topic, he/she should use the descriptors shown at the bottom of the abstract page as guides to the index section where related documents are listed.

As with all RDIS products, this document is made available to educational practitioners through the various Regional Exchange (Rx) projects of the Research

and Development Exchange (RDx). The R & D Interpretation Service works in support of the network of Regional Exchanges, listed on page 4.

Each Regional Exchange has been provided copies of this bibliography for distribution to educators in the states it serves. For more information about RDIS and its work, contact the appropriate Regional Exchange or the R & D Interpretation Service at the Appalachia Educational Laboratory.

This document is an RDIS ancillary product. The project's primary work is the development of interpretive reports for the Research Within Reach series. The latest report, the fifth in the series, is about science education. Others in the series deal with elementary mathematics, secondary mathematics, elementary reading, and oral and written communication.

BACKGROUND

The R & D Interpretation Service is a part of the Research and Development Exchange, a federal effort that grew out of efforts designed to bring the worlds of educational research and school practice closer together. The RDx, a system of eight Regional Exchanges and supporting services is funded by the National Institute of Education. RDIS, a supporting partner in the system, exists to put research within teachers' reach. This is done through publication of the Research Within Reach books and bulletins, which synthesize research findings and discuss their classroom implications for teachers.

The process RDIS uses for developing its publications is unique. Instead of letting the research guide the process, RDIS goes first to the practitioner--the teacher, administrator, and supervisor--for the questions they want answered. Then, with the help of a panel of experts, these questions are categorized and representative questions are answered, using the latest information from the education research community. (It is at this stage, incidentally, that the

bibliography is produced.) The answer to each question includes a synthesis of the relevant research, a discussion of classroom implications, and interpretation of the research for classroom use. An extensive review process is used. Each draft product is distributed to other members of the research community to ensure comprehensive coverage of the research literature and to members of the particular community to ensure usefulness of information and appropriateness of format and language.

The Science Consultant Panel assisting in RDIS' latest effort includes: Lowell Bethel, Science Education Center, the University of Texas at Austin; Jack Gerlovich, Iowa Department of Public Instruction; Leopold Klopfer, Learning Research and Development Center, University of Pittsburgh; James Minstrell, Mercer Island (Washington) High School; Mary Budd Rowe, Office of Curriculum Specialization, University of Florida; and Robert Yager, Science Education Center, University of Iowa.

It is our pleasure to acknowledge the contributions to this bibliography of our colleagues within the RDx, in state departments of education, and at universities and schools throughout the nation. These people all called our attention to important research, in many cases, furnishing us with copies of original documents.

The actual work of producing the bibliography was done by Marianne Herr-Paul and Phyllis O'Donnell, abstractors/indexers, and Lori Anne Roberts, project secretary.

Finally, we would like to close by mentioning that a supplement that updates the bibliography will be prepared in November 1984. If you know of work which should be included in the update, please let us know.

The Research and Development Exchange

The Research and Development Exchange (RDx) is a federal effort to bring the worlds of educational research and school practice closer together. The Exchange, operated by a consortium of regional educational laboratories and a university-based research and development center, is supported with funding from the National Institute of Education. Currently the R & D Exchange consists of three central support services, including the Research and Development Interpretation Service and eight Regional Exchanges working through 50 cooperating state departments of education. The Regional Exchanges and their cooperating states are listed below:

Appalachia Educational Laboratory (AEL) P.O. Box 1348 Charleston, West Virginia 25325	Alabama, Florida, Georgia, Kentucky, Ohio, North Carolina, South Carolina, Tennessee, Virginia, & West Virginia.
Far West Laboratory for Educational Research & Development (FWL) 1855 Folsom Street San Francisco, California 94103	Northern California, Nevada, & Utah.
McREL 4709 Belleview Kansas City, Missouri 64112	Colorado, Kansas, North Dakota, South Dakota, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Wisconsin, Nebraska, & Wyoming.
Northeast Regional Exchange (NEREX) 160 Turnpike Road Chelmsford, Massachusetts 01824	Connecticut, Massachusetts, Maine, New York, New Hampshire, Rhode Island, & Vermont.
Northwest Regional Exchange Laboratory (NWREL) 300 S.W. Sixth Avenue Portland, Oregon 97204	Alaska, Hawaii, Idaho, Montana, Oregon, & Washington.
Research for Better Schools, Inc. (RBS) 444 North Third Street Philadelphia, Pennsylvania 19123	Delaware, Maryland, New Jersey, & Pennsylvania.
Southwest Educational Development Laboratory (SEDL) 211 East Seventh Street Austin, Texas 78701	Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, & Texas.
SWRL Research and Development (SWRL) 4665 Lampson Avenue Los Alamitos, California 90720	Arizona, California, Nevada, & Utah.

Accession Number: SC 189 J

Abeles, Sigmund. "The Shortage of Science Teachers". Connecticut Journal of Science Education 19, 2 (Spring-Summer 82): 1-7.

Availability:

ERIC Document Reproduction Service
P.O. Box 190
Arlington, VA 22210

Order Number: EJ 268 937

Abstract:

The problem of science and mathematics teacher shortage is reviewed and concluded as being critical. Information concerning teacher shortage is taken from certification sources, teacher vacancy notifications to state departments, teacher retirement information, median age and experience of science teacher data and survey information for identification of "demand" for science teachers. Much of the information is specific from the Department of Education in Connecticut. Some data are taken from out-of-state sources. The article is intended to point attention to the general need for concern in educating and educationally placing more science teachers. The author suggests that salary increases and environmental improvements be considered priorities for the future to attract science teachers to education.

Descriptors: Science Teachers, Teacher Recruitment, Teacher Supply, Certification in Science, New Science Teachers

Accession Number: SC 014 J

Abraham, Michael R. "Priorities for Research in Science Education: A Survey". Journal of Research in Science Teaching 19, 8 (NOV 82): 697-704.

Availability:

Order Number: EJ 270 270

Wiley-Interscience
Division of John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

In 1979, all members of the National Association for Research in Science Teaching (NARST) were asked to list in order of priority what they believed to be the five most needed areas of research in science education. A total of 101 members (13% of the membership) responded and listed 398 statements of needed research, from which six general classes of research needs were identified. Of 31 unique categories, 3 emerged as the greatest concern of the NARST members responding to the survey: instructional strategy, learning, and student and teacher attitudes. These prioritized categories corresponded to those found in earlier work on the identification of research needs. Thus research should focus on strategies of instruction, on the developmental and intellectual abilities of students for learning, and the attitudes of those involved in the classroom of science education. (Author Abstract Modified)

Descriptors: Research Needs, Science Education, Science Instruction, Student Interests, Student Attitudes, Teacher Attitudes, Instructional Improvement

Accession Number: SC 097

Abraham, Michael R.; and Fox, Fred W., eds. 1979 AETS Yearbook, Science Education/Society: A Guide to Interaction and Influence. Columbus, OH: ERIC/SMEAC Information Reference Center, 1979.

Availability:

Order Number: ED 164 360

ERIC/SMEAC Information Reference Center
The Ohio State University
1200 Chambers Road, 3rd Floor
Columbus, OH 43212

Abstract:

The papers which make up this AETS (Association for the Education of Teachers in Science) Yearbook are designed to explore the interrelationship of science and societal issues from the point of view of science education. Issues were chosen to explore two aspects of science education/society: their interaction with and their influence upon each other. The first part of the Yearbook focuses on topics of concern to society which are either science-based or a function of science teaching, and refer specifically to energy, population, pollution, natural resources, human behavior, sex education, genetic issues, parapsychology, astrology, creationism, drugs, and technology. The second part deals with societal institutions or social movements which influence science education, e.g., curriculum projects, the textbook, U.S. Government funding, professional associations, handicapped students' science education needs, and career education. The third part is concerned with the nature of science education/society interaction, exploring value issues in science teaching, the issue of change in science education, and the themes of values, interdisciplinary concerns, and relevancy. Topics covered are by nature controversial. The papers are intended to give an overview of current societal issues of importance to science education teachers.

Descriptors: Science Instruction, Science Education, Societal Change, Social Influences, Social Values, Science Attitudes

Accession Number: SC 100 P

Aikenhead, Glen S. Trade Offs in Teacher Decision Making: The Case of Prairie High. Saskatoon, Saskatchewan,CA: University of Saskatchewan, 1983.

Availability:

University of Saskatchewan
Saskatoon, Saskatchewan
Canada S7N 0W0

Order Number:

Abstract:

Decisions that science teachers make when they plan for instruction (pre-active decisions) were analyzed in a case study of five teachers in a Saskatchewan high school, which probed into the personal reasons, beliefs and dilemmas underlying their decisions. The case study was one of eight funded and coordinated by the Science Council of Canada to assess science teaching in Canada. Confidentiality contracts were used to protect teachers. Teachers' decisions, while serving many purposes, had a common structure which involved trade offs and compromises. The decisions represented the end result of the conflict between a cluster of teacher intentions and a melange of ideas about student characteristics. Teachers appeared to make decisions within a framework that holistically integrated science content and practical classroom knowledge, a knowledge system that includes the basic beliefs of a teacher and the socialization of students. By understanding how and why teachers tend to make their decisions, practical insights can be made into the act of teaching science. These insights are of particular interest to science curriculum specialists who wish to understand how teachers use science curriculum materials for the purpose of socializing students. (Author Abstract Modified)

Descriptors: Science Instruction, Science Teachers, Decision Making, Curriculum Development, Teacher Attitudes, Lesson Plans, Teacher Behavior, Teacher Motivation

Accession Number: SC 043

American Black Scientists and Inventors. Washington, D.C.: National Science Teachers Association, 1975.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

The stories of 12 American black scientists and inventors are recounted here. Despite their accomplishments, these scientists and inventors remain largely anonymous. The stories recount their contributions in the face of social and political barriers created because of their race. The 12 include Ernest E. Just, cell physiologist; Garnett Augustus Morgan, inventor of products ranging from the gas mask to the automatic traffic light; George Washington Carver, agricultural scientist; Benjamin Banneker, astronomer; Percy L. Julian, soybean chemist (synthesizing physostigmine); and Granville T. Woods, a railway communications wizard. The remaining six are Charles Richard Drew, a blood plasma pioneer; Charles Henry Turner, a scientist, teacher, author, and humanitarian; Matthew A. Henson, the first explorer to reach the North Pole; Leon Roddy, expert on spiders; Elijah McCoy, inventor of self-lubricating machines (from which comes the expression "the real McCoy" denoting impeccable performance and quality); and Daniel Hale Williams, a pioneer in heart surgery around the turn of the century. References to books about or by each of these men are provided for further reading.

Descriptors: Black History, Blacks, Black Achievement, Scientists, Science History, Inventions, Research, Innovation

Accession Number: SC 173

Amidel, Rosemary E.; Frederick, Charles L.; and Yager, Robert, eds. Environment: The Human Factor/Selections from the Science Teacher. Washington, D.C.: National Science Teachers Association, 1973.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

This book is a compilation of readings that have been taken from the Science Teacher Journal on themes that occur often in environmental education instruction. The book is divided into five major parts. Part I includes the views of many authors regarding the nature and breadth of environmental problems. Part II deals with varying information that serves as a background to environmental problems. Part III offers plans for building educational curricula, and Part IV includes research projects and classroom strategies for students. Part V is intended as a resource section and is made up of book reviews and materials' lists. Part I through IV are broad in scope and overlap in content area to some degree. The information contained in the book can be used for most science education oriented interests, including those which pertain to outdoor laboratories, relevancy for students, outcomes for science study, factors affecting the learning of science, and the relationship of science to other subjects.

Descriptors: Environmental Education, Science Education, Pollution, Ecology, Earth Science, Energy, Technology Education, Conservation Studies, World Science

Accession Number: SC 074

Anderson, Norman D. The Preparation of High School Science Teachers in North Carolina: Baseline Data for the 1980's. Science Education Report. Raleigh, NC: North Carolina State University, 1981.

Availability:

Order Number: ED 214 796

Department of Mathematics and Science Education
North Carolina State University
326 Poe Hall
Raleigh, NC 27650

Abstract:

From 1968 to 1970, three separate studies of North Carolina science teachers were conducted in the areas of biology (N=177), chemistry (N=101), and physics (N=71). The three studies shared three major purposes, to determine: (1) the academic preparation of the science teachers being investigated, (2) the relationship between the level of academic preparation and school size, and (3) the relationship between the level of academic preparation and the amount of supplement to the state salary schedule paid by the employing school district. A fourth study of advanced high school biology teachers (N=100) was conducted: (1) to determine the academic preparation of advanced biology teachers and other factors such as teaching loads and years of experience, and (2) to compare the preparation of teachers of advanced biology with that of teachers of tenth-grade biology. Results of these studies are summarized in this document. Comments and recommendations are made in four areas: teacher certification, teacher preparation programs, school practices, and future research. (Author/ERIC Abstract)

Descriptors: Biology, Chemistry, Physics, Science Teachers, Secondary School Science, Teacher Education, Science Education Research

Accession Number: SC 166

Anderson, Ronald D. A Review of Research in Science Education for the Year 1971. Columbus, OH: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1973.

Availability:

ERIC Information Analysis Center for Science,
Mathematics, and Environmental Education
400 Lincoln Tower
Columbus, OH 43210

Order Number:

Abstract:

The purpose of the science review is as stated by the author, to "provide a characterization of the current state-of-the-art and an examination of its key strengths and weaknesses as a guide for future research". Three major sections are included as well as lesser miscellaneous sections. "Instructional Procedures and Materials" includes specific reviews of product development activities, product evaluation, and instructional procedures. Another major section titled "Learning and the Learner", includes studies of educational outcomes and the factors related to them, studies of learning theory and studies of science student characteristics. This last is cited by the author as being of the poorest quality of any categorical studies contained in the review. He states that this is an area seemingly subject to random collection of data, and non-specific hypotheses. The third major section, "Teaching and the Teacher", reviews teacher characteristics, the teaching process, and studies in teacher education.

Descriptors: Science Teachers, Science Curriculum, Teacher Behavior, Learning, Science Instruction, Lesson Plans, Learning Characteristics

Accession Number: SC 078 P

Anderson, Ronald D.; and Others. The Major Questions Addressed by the Extant Science Education Research: A Map for Meta-Analysis. Boulder, CO: Laboratory for Research in Science and Mathematics Education, 1981.

Availability:

Order Number: ED 202 739

Laboratory for Research in Science
and Mathematics Education
University of Colorado
Boulder, CO 80309

Abstract:

The paper presents a report on the first phase of a large scale meta-analysis of the field of science eudcation in which the major research questions pursued in the extant science education research literature were identified and organized to provide a conceptual framework for meta-analysis. The six major research questions identified from this project are listed. (ERIC Abstract)

Descriptors: Research Methodology, Research Needs, Science Curriculum, Science Instruction, Meta Analysis, Science Education Research

Accession Number: SC 065

Anderson, Ronald D.; and Others. Science Meta-Analysis Project: Volume II. Final Report. Boulder, CO: Laboratory for Research in Science and Mathematics Education, 1982.

Availability:

Order Number: ED 223 476

Laboratory for Research in Science and
Mathematics Education
Campus Box 249
University of Colorado
Boulder, CO 80309

Abstract:

The National Science Foundation funded a project to: (1) identify major areas of science education research in which sufficient studies have been conducted to permit useful generalizations for educational practice; (2) conduct meta-analyses of each of these areas; and (3) prepare a compendium of these meta-analyses along with interpretative and integrative statements. This report is the second volume of the compendium, which includes three studies: "A Meta-Analysis of Research on Science Teacher Education Practices Associated with Inquiry Strategy" (Gary L. Swaitzer), "Science Teacher Characteristics by Teacher Behavior and by Student Outcome" (Cynthia Ann Druva), and "The Relationship of Student Characteristics and Student Performance in Science" (M. Lynette Fleming and Mark R. Malone). Table of contents, purpose, methodology, results, and conclusions are presented for each study. The last section includes a discussion directed at consolidating information on selected matters addressed in two or more of the separate meta-analyses and examining the relationship between results of these meta-analyses and other work of this nature conducted by other researchers. Coding forms and a complete bibliography of studies used and coded are provided in two extensive appendices. (Aurthor/ERIC Abstract)

Descriptors: Academic Achievement, Inquiry, Science Teachers, Student Characteristics, Teacher Characteristics, Meta Analysis, Science Education Research

Accession Number: SC 079

Audeh, Ghazi Rifat. A Longitudinal Study of Science Curriculum and Practices in Elementary Schools in 10 States (1970-1980). Columbus, OH: The Ohio State University, 1982.

Availability:

Order Number: ED 214 802

The Ohio State University
Columbus, OH 43210

Abstract:

This longitudinal study was designed to: (1) identify the current status of elementary science teaching and characteristics of science teachers in a sample of 100 public elementary schools (K-6) that participated in a 1970 study; (2) investigate certain changes in the foregoing since 1970; (3) identify principal's and teacher's attitudes (perceptions and feelings) toward change in science programs and practices and toward certain aspects related to elementary science education; and (4) determine if there were relationships between the level of state control of education measured by a School Centralization Score and selected variables. Principals and three randomly selected teachers from 10 schools in 10 states participated in the study. Data were gathered by using three instruments administered to each respondent. Findings supported those of other national studies with respect to level of teacher preparation; no improvement in science content background or in teachers' instruction methodology were reported. A trend toward less use and less availability of consultants seemed to be taking place. Less emphasis on science appeared to be given in 1980. Although some changes were made, the majority of schools had not substantially changed their science teaching practices during the past decade (1970-1980). (Author/ERIC Abstract)

Descriptors: Educational Change, Elementary School Science, Longitudinal Studies, Science Curriculum, Science Instruction, Science Teachers, Science Education Research

Accession Number: SC 159

Ausubel, David P. The Use of Ideational Organizers in Science Teaching. New York, NY: Center for Advanced Study in Education, 1970.

Availability:

Order Number: ED 050 930

City University of New York
Division of Teacher Education
Center for Advanced Study in Eduation
New York, NY 10036

Abstract:

The paper deals with organizational issues in curriculum. The author states that cognitive structure as it relates differently to students' structure of knowledge in a given subject should be the principal issue influencing learning in a classroom setting. He encourages the use of "organizers" to facilitate learning (1) substantively by using unifying concepts which have the greatest inclusiveness, and (2) programmatically by using effective teaching methods of ordering sequence of subject matter. Other issues included in the paper question current choices in content of science teaching. The author supports a more naturalistic approach to the teaching of science with less emphasis on analytical, quantitative, and experimental aspects of science and favors science texts directly appropriate to students' use rather than teachers. He also discusses the use of collaboration for producing curriculum materials and the need for integration of design in planning curriculum.

Descriptors: Science Teaching, Curriculum, Science Education, Science Instruction, Instructional Improvement, Organizational Structure

Accession Number: SC 167

Balzer, A. LeVon; and Others. A Review of Research on Teacher Behavior Relating to Science Education. Columbus, OH: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1973.

Availability:

ERIC Information Analysis Center for Science,
Mathematics, and Environmental Education
The Ohio State University
400 Lincoln Tower
Columbus, OH 43210

Order Number:

Abstract:

Approximately 90 studies of classroom behavior in science are reviewed in this document. Also included is a review of research related to teacher behaviors in classrooms other than science. The book is the first of a yearbook series, which will focus on separate topics considered timely and relevant. The focus of this volume is reviews affecting teacher education in the sciences. In the first section, is a general review of instruments and procedures used, and descriptive information on the following areas of research: theoretical framework, rational method of instrument development, description of instrument encoding procedures, instrument reliability, and validity data from classroom use of instruments. The second section reviews the discussion of classroom behavior and interaction in science in six major document types: abstract of doctoral dissertations, papers presented at meetings, professional journal articles, doctoral dissertations, books, and nonpublished reports. This second session discusses more than 500 studies of teacher behavior in content areas other than science.

Descriptors: Classroom Management, Teacher Effectiveness, Classroom Behavior, Science Teachers, Science Curriculum, School Science, Science Research, Teacher Behavior, Teaching Skills

Accession Number: SC 187 J

Beasley, Warren. "Teacher Demonstrations: The Effect on Student Task Involvement". Journal of Chemical Education 59, 9 (SEP 82): 789-790.

Availability:

Journal of Chemical Education
119 W. 24th Street, 4th Floor
New York, NY 10011

Order Number: EJ 268 855

Abstract:

The author of this article discusses the relevance of teacher demonstrations in high school science teaching. Observation recordings of 24 classrooms were made by video tape. From these recordings 91 pupil tapes were coded for pupil task involvement. Task involvement categories included pupil behavior, coded as follows: "definitely in" the assigned work, "probably in" the assigned work, "waiting" for the next task, and "out" of the task. Four lessons by each science teacher (16 men and 8 women) were observed. Nine teachers undertook science demonstration lessons. Other methods addressed in this article include exposition and exposition with props. The findings presented indicated increased levels of pupil attention and task involvement during demonstration segments of class time to a significant ($p. < 0.05$) level when compared with that of exposition or exposition with a prop. The author suggests that though laboratory-centered science teaching in high school has decreased in recent years, demonstration in science classes should not be allowed to decrease.

Descriptors: Demonstration Teaching, Science Teachers, Science Curriculum, Teaching Classroom Observation, Interaction in Science

Accession Number: SC 046 B

Biology...Its People and Its Papers. Washington, D.C.: National Science Teachers Association, 1973.

Availability:

National Science Teachers Association
1201 16th Street, N.W.
Washington, D.C. 20036

Order Number:

Abstract:

Original research papers of outstanding biologists from the mid-16th century to the mid-20th century are presented as supplements to the regular biology textbook for secondary school students. Each is accompanied by an introduction to the biologist and his historical importance and a set of guide or study questions. The papers serve as a framework around which lessons can be built. The papers are grouped into the subject categories of unity among living things, the biology of human beings, the biology of plants, the conquest of disease, the origin of life, the origin of new organisms, the transfer of traits, and observation and experimentation. Within these categories, discussion ranges from evolutionist theory, Salk and polio vaccines, alchemy, ecology and diabetes, to the Double Hilex, X-Rays, heredity and DNA. These research papers are intended to show what scientific enterprise is about. Scientists represented include Robert Hooke, Anton van Leeuewnhoek, William M. Bayliss, Ernest H. Starling, Christiaan Eijkman, Jean Baptiste van Helmont, Edward Jenner, Louis Pasteur, Joseph Lister, Robert Koch, Walter Reed, Paul Ehrlich, Albert B. Sabin, Francisco Redi, Lazaro Spallanzani, Charles Darwin, Alfred Russel Wallace, Gregor Mendel, Hermann J. Muller, and Arthur Kornberg.

Descriptors: Biology, Scientific Research, Scientists, Scientific Methodology, Science Instruction, Secondary School Science, Textbooks, Science History

Accession Number: SC 107

Blosser, Patricia E. A Critical Review of the Laboratory in Science Teaching. Columbus, OH: Center for Science and Mathematics Education, 1981.

Availability:

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
College of Education
1200 Chambers Road, Third Floor
Columbus, OH 43210

Order Number:

Abstract:

This review was conducted in an effort to examine, from an accountability point of reference, the usefulness of the laboratory in the teaching of science. The laboratory in science is duscussed from a historical perspective, a research one, from opinion statements gathered, and in the light of current research. Results of data show no clear profile either for or against use of the laboratory. Opinions strongly favor its continued use. Little evidence is gathered for documentation of contribution to its use in science education. Questions arise as to the goal of science, in its use of the laboratory, as a content or process oriented curriculum. Results of the review include recommendation for research of practices, purposes, conditions, and students for which laboratories in science are needed.

Descriptors: Science Education, Science Teaching, Science Laboratories, Teacher Attitudes, Instructional Improvement, Research Needs

Accession Number: SC 182

Blosser, Patricia E.; and Mayer, Victor J. Investigations in Science Education 8, 3 (1982): Entire Issue.

Availability:

Order Number:

The Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Abstract:

The book is divided into four major areas. One portion deals with teacher education; another with achievement issues; another with cognitive variables; and the last with issues related to research in science engineering and women, science and mathematics, and science needs assessment of elementary teachers. The teacher education portion contains four investigations covering teacher perceived needs, awareness of population education materials, relationships, acquisition of science process skills by prescience elementary teachers, and feedback questioning effects on prescience teachers in micro-teaching. The achievement portion contains two articles, one regarding testing and study skills for college biology, the other on biology curriculum and intellectually/culturally heterogeneous classes. Cognitive variables are the topic of a four article section dealing with (1) the relationship between cognitive abilities, academic performance, and affective school characteristics; (2) effects of laboratory-oriented experience on stability of teacher cognitive styles; (3) the Bowie and Trabasso model of concept identification; and talented high school students' cognitive preferences in biology. (Author Abstract Modified)

Descriptors: Teacher Education, Teacher Cognitive Styles, Teaching Styles, Achievement, Needs Assessment, Science Process Skills

Accession Number: SC 184

Blosser, Patricia E.; and Mayer, Victor J. Investigations in Science Education 8, 1 (1982): Entire Issue.

Availability:

The Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Order Number:

Abstract:

Eight of the 13 investigations contained here focus on attitudes. The remaining five are critiques and responses. Included in the discussions are environmental attitudes toward assessment; effects on student attitudes of perceived preferred learning environments; and curriculum evaluation, including five attitude scales--school/student variables and attitudes of tenth grade students, effects of essay writing on undergraduate students, content reading methods and field centered teacher preservice science, field-based science (elementary), teacher education programs, and prescience teacher attitudes toward teaching science. Critiques and responses include one on the educational uses of a planetarium and paired critiques/responses on (1) the relationship of intellectual development and written responses to essay questions, and (2) curriculum materials and teacher behavior.

Descriptors: Teacher Attitude, Student Attitude, Cognitive Growth, Developmental Psychology, Teacher Preservice Education, Learning Styles

Accession Number: SC 146

Blosser, Patricia, ed. Investigations in Science Education 7, 4 (1981): Entire Issue.

Availability:

Order Number:

Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Abstract:

This final issue of Volume 7 contains abstracts of eight research papers relating to science curricula, learning, and evaluation of an instrument designed to measure students' orientation toward science. Each abstract details the papers' purpose, rationale, research design and procedure, findings, and interpretations, and then conducts an independent analysis of the paper. The curriculum studies look at the specific programs of the Nuffield combined science course, a course entitled Physics for Elementary Teachers, and a British primary school science curriculum. A fourth curriculum study investigates Israeli pupils' understanding of the role concept and the necessity for knowing more about the curriculum within which the concept was presented. The learning studies consider Piagetian ideas on the concept of proportionality as held by college students, Gagne's learning hierarchies as related to learning about electric circuits, Guilford's Structure of the Intellect model used with a COPES learning sequence, and Novak-Ausubel cognitive structure and achievement in college biology. A final analysis describes an investigation of the empirical validity of Meyer's Test of Interests, an instrument that has been used with both English and Israeli students.

Descriptors: Science Instruction, Science Curriculum, Learning Theories, Abstracts, Cognitive Style, Cognitive Measurement

Accession Number: SC 145

Blosser, Patricia; and Mayer, Victor J., eds. Investigations in Science Education 7, 3 (1981): Entire Issue.

Availability:

Order Number: ED 204 177

Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Abstract:

Analyses of nine research papers cluster into two areas: teacher education and cognitive development. Within the first cluster, one paper reports on research involving elementary education majors' self-concept, attitudes and science process skills, while another looks at the influence of teacher background variables on students' achievement. Information is presented about Israeli teachers and their attitudes toward and participation in in-service education activities. Two other studies involve "teacher effectiveness" research and investigation of strategy analyses in a methods course with preservice teachers. The cognitive cluster of research predominates in Piagetian theory. In this context, papers focus on Mexican-American pupils studying science, student cognitive characteristics and classroom behaviors, the achievement of nonconservers in BSCS biology, and strategies first grade children use in performing a seriation task. Each of these abstracts or analyses details the purpose, rationale, research design and procedure, findings, and interpretations of the original paper, and develops an independent analysis of it. A final paper responds to a critique of an article presented earlier in the document.

Descriptors: Science Education, Teacher Education, Science Teachers, Elementary School Teachers, Inservice Teacher Education, Preservice Teacher Education, Psychoeducational Methods, Cognitive Development, Learning Strategies, Sciences, Elementary School Students, Abstracts

Accession Number: SC 144

Blosser, Patricia, ed. Investigations in Science Education 7, 2 (1981): Entire Issue.

Availability:

Order Number:

Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Abstract:

Analyses of ten articles relate to the study of attitudes. These abstracts detail the purpose, rationale, research design, procedure, findings, and interpretations, as well as developing an independent analysis of the research. Two papers investigate the effects of instructors' attitudes on students. Another surveys the attitudes of high school students toward nuclear science. One paper studies the attitudes of black students concerning various factors relating to science. The development of an instrument to measure the attitudes of high school students toward chemistry and their interest in laboratory work is reported. Information is provided concerning the use of value sheets and their influence on the attitudes of high school students about various instructional procedures. Several papers look at attitudes which nonscience majors hold about science and technology, and the attitudes of elementary school teachers toward science. One study attempts to determine if a relationship exists between class size and student attitudes toward science. Yet another examines students' attitudes regarding computer-assisted instruction in astronomy.

Descriptors: Science Instruction, Attitudes, Teacher Attitudes, Student Attitudes, Sciences, Chemistry, Nuclear Physics, Secondary School Students, Elementary School Teachers, Class Size, Classroom Environment, Abstracts

Accession Number: SC 143

Blosser, Patricia, ed. Investigations in Science Education 7, 1 (1981): Entire Issue.

Availability:

Order Number:

Center for Science and Mathematics Education
The Ohio State University
1945 North High Street
Columbus, OH 43210

Abstract:

These abstracts of ten papers culled from research in science education all emphasized instruction. Each abstract detailed the purpose, rationale, research design and procedure, findings, and interpretations of the original paper, and also developed an independent analysis of the paper. Science content and the educational level of the students involved varied with the article being considered. The first looked at the relationship of high school chemistry instruction and divergent thinking, while the second described the use of the Learning Environment Inventory for gaining information about student perceptions of their classroom environment. Others dealt with student information processing behaviors, small group interaction in a problem-solving situation, and teacher-student interaction in activity-based science lessons. Three articles focused on the pace of instruction, such as the influence of teacher control of the pace of instruction on learning rates, teacher pacing vs. self-pacing in physical chemistry, and the use of worksheets in self-paced and group-paced settings. One paper compared the use of structured vs. unstructured laboratories in introductory college physics. Finally, the use of the school planetarium is considered in the educational context. An additional piece responds to an article critiqued in a previous issue.

Descriptors: Science Instruction, Learning Theories, Chemistry, Student Attitudes, Physics, Secondary School Science, Pacing, Abstracts, Experiential Learning

Accession Number: SC 183

Blosser, Patricia E. "Science Teacher Supply and Demand". ERIC Fact Sheet, 1 (1983).

Availability:

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
1200 Chambers Road, 3rd Floor
Colubmus, OH 43215

Order Number:

Abstract:

The fact sheet outlines factors influencing the demand for science teachers--the economy, military requirements, unforeseen changes in social conditions, and new processes in school curriculum. Studies in teacher supply and demand are also reviewed, particularly studies performed in New York, Iowa, and Washington. Considered are background situations specific for types of regional areas, data needs for more accurate information recording, and historical sequence of crisis events in creation of the current shortage.

Descriptors: Educational Crisis, Science, Curriculum Needs, Teacher Supply, Science Teachers

Accession Number: SC 026 J

Booth, Norman. "The Impact of Science Teaching Projects on Secondary Education". Trends in Education 1 (FEB 75): 25-32.

Availability:

National Center for Education Statistics
400 Maryland Avenue, S.W.
Washington, D.C. 20202

Order Number: EJ 115 397

Abstract:

In this article, Great Britain's Association for Science Education looks at its science curriculum innovations from the mid-1960's to the mid-1970's. It traces the development and emphases of new teaching materials to the decision that they should be distributed directly to volunteer classrooms for testing. The emergence of such an empirical approach, dubbed the Nuffield Science Teaching Project, is chronicled, along with other more radical projects: one sponsored jointly by the Schools Council, the Nuffield Foundation, and the Scottish Education Department; a Schools Council Integrated Science Project subtitled, "Patterns"; and the Schools Council "Project Technology". The impact on schools of each of these projects is documented with questionnaire results showing whether schools were "doing" or "using" the materials. Comments pointing to the need for teaching materials to keep up with teaching styles and school organizational modes also sum up how well these various projects meet with current expectations and needs.

Descriptors: Science Materials, Science Instruction, Material Development, Curriculum Development, Student Developed Materials, Teacher Developed Materials, Curriculum Evaluation

Accession Number: SC 141

Bowman, Mary Lynne; and Disinger, John F. Environmental Education in Action-IV: Case Studies of Teacher Education Programs for Environmental Education. Columbus, OH: ERIC Clearinghouse for Science Mathematics and Environmental Education, 1980.

Availability: Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road
Columbus, OH 43212

Abstract:

Specialists in environmental education in state education agencies recommended this compilation of studies, which describes college and university programs in environmental education for teachers. Some universities represented are Florida State University, the University of Maine, the University of Vermont, the University of Northern Iowa, Michigan State University, Western Washington University, Kansas State University, and Ball State University. Some colleges are the Antioch/New England Graduate Program, Huxley College, Southern Oregon State College, Metropolitan State College, and Slippery Rock State College. Programs outlined range from those for elementary and middle childhood majors, master's degrees in general studies, inservice and summer institute programs, and outdoor education programs, to training of environmentalists, and cooperative efforts in education and science for environmental education. At issue are ethical and ecological concerns, the interdisciplinary nature of environmental education, environmental action skills teaching, and the need for environmental literacy in a world more and more endangered by environmental ignorance and misuse.

Descriptors: Environmental Education, Science Teachers, Inservice Teacher Education, Preservice Teacher Education, Science Education, Interdisciplinary Approach, Activism, Ecology

Accession Number: SC 004

Bronowski, J. Science and Human Values. New York, NY: Harper & Row, Inc., 1975.

Availability:

Harper Torchbooks
Harper & Row, Inc.
10 E. 53rd Street
New York, NY 10022

Order Number:

Abstract:

The practice of science compels the practitioner to form for himself or herself a fundamental set of universal values. While science is often viewed as merely dull, uncreative collections of facts, it is as much an imaginative act of understanding and as much an integral part of the culture of an age as are the arts. Science is the organization of knowledge in such a way as to command more of the hidden potential in nature, to explore hidden likenesses, and to search for unity in variety, just as do the arts. That search also involves searching for the truth, which in science is an ordering of the facts, of experience in patterns, of scientific laws which are then condensed around concepts. Truth is the drive at the center of science, not as a dogma, but as a process. Yet science must gain its ends only within the laws of nature, not by attempting to master it. The work of science is of a piece, in the large and in detail, so that if one self-deceptive scruple about the means is silenced, everyone and their ends are affected. Hence, in science, ethics, human dignity and integrity grow naturally out of the process itself. The values by which scientific and artistic humanity are to survive are not rules for just and unjust conduct, but are those deeper illuminations in whose light justice and injustice, good and evil, means and ends are seen in fearfully sharp outline.

Descriptors: Moral Development, Values Clarification, Scientific Principles, Scientific Research, Science Ethics, Moral Values, Scientific Attitudes

Accession Number: SC 192 J

Brooks, Martin; Fusco, Ester; and Grennon, Jacqueline. "Cognitive Levels Matching". Educational Leadership 40, 8 (MAY 83): 4-8.

Availability:

Order Number:

Association for Supervision and Curriculum Development
225 N. Washington Street
Alexandria, VA 22314

Abstract:

The authors state as an hypothesis that changes in growth of the brain may structurally set up the neurobiological possibility for the occurrence of a change in cognitive functioning. Such changes are facilitated by relevant instructional intervention and experience. The report converges the findings of several previous researchers of cognitive development (Piaget, Epstein, Inhelder) and points out contrasting views between the assertion that nearly all adolescents possess mental structures developed enough to do formal operations (Piaget, Inhelder, 1958) and the divergent view (Epstein, 1974, 1978) that only about 34 percent of all adolescents use formal operational thought. Other researchers indicate ranges (Martorono, 1977; Numack, 1975; Schwebel, 1972) of between 20 and 74 percent of adolescent capability for formal operational thought. A consideration is also presented for inclusion of more stages of development of cognition than was originally described by Piaget. The authors suggest the need of reconstruction of current science curriculum for adolescents, which better match cognitive tasks to probable developmental abilities. They also suggest the assessment of student cognitive level by analysis of student questions and responses.

Descriptors: Adolescent Psychology, Cognitive Development, Science Curriculum, Piaget, Formal Constructs, Brain Growth

Accession Number: SC 106

Buchmann, M. The Priority of Knowledge and Understanding in Teaching (Occasional Paper No. 61). East Lansing, MI: Institute for Research on Teaching, 1983.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

This paper on the central and distinctive contribution of knowledge to teaching combines philosophical analysis with a discussion of work in research on teaching, student conceptions, and curriculum. The hierarchical argument contains two main points: (1) that content knowledge is a logical precondition for the activities of teaching, and (2) that the firm grasp of subject matter has to be relaxed to allow for its pedagogical, fluid control, that is, the extent to which teachers hold knowledge with ease and flexibility and keep the door open to different points of view. Lacks on the depth and assurance of teachers' knowledge of content can act as conceptual and behavioral traps that lead teachers and students away from education to outward forms of achievement, misconceptions, and procedural concerns. But factual and conceptual control of subject matter is not enough for teachers. Given the pedagogical requirement for flexible control of subject matter, knowledge of epistemology and history of science is a specific preparation for teaching. Knowledge of this kind deepens understanding of subject matter, encourages the mobility of teacher conceptions, and yields pedagogical knowledge in the form of multiple and fluid conceptions. Policy implications of this argument for the curriculum of teacher education, selection into the profession, and conventional modes of classroom induction are discussed. (Author Abstract)

Descriptors: Knowledge, Theory, Pedagogy, Improved Teaching, History of Science, Policy, Teacher Education

Accession Number: SC 112

Buchmann, M.; and Schmidt, W.H. The School Day and Content Commitments (Research Series No. 83). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

When teachers make judgments on content emphasis for their classrooms, they are influenced by social and institutional, or external factors. Judgments on content emphasis, however, also reflect the commitments that teachers have to content, their attitudes toward teaching certain areas of the curriculum, and teachers' assessment of their own competence in teaching these areas. In looking at the effects of internal factors on the school day, three questions were considered. First, what relationship, if any, is there between an internal factor and the actual choices teachers make with regard to time and content? Second, what is the content profile for the whole day, given certain response levels on internal factors? Third, if time allocations in the school day affect each other, are there consistent trade-off patterns between content areas? The data analyzed stem from an observational study of six classrooms and from questionnaires administered to teachers in the same study. The findings show clear and interesting patterns of association among (subject matter specific) variables such as attitude and competence and time allocations in the school day. (Author Abstract)

Descriptors: Teaching Content, Teachers' Choices, Research, Observational Study, Time Allocation, Teacher Attitude, Teacher Competence

Accession Number: SC 137 J

Burkman, Ernest; and Others. "Effects of Academic Ability, Time Allowed for Study, and Teacher Directness on Achievement in a High School Science Course". Journal of Research in Science Teaching 18, 6 (NOV 81): 563-576.

Availability:

Order Number: EJ 255 505

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The simultaneous effects of the two instructional variables of degree of teacher direction (student-directed versus teacher-directed) and time allowed for study and the student variable of general ability are described for student achievement in three life-science instructional modules covering approximately three months. The instructional variables were controlled in this study; that is, high school teachers were randomly assigned to one of six combinations of the student-directed versus teacher-directed method variable and the allowed time variable with three levels. Between-class, within-class, and between-student analyses of data for 912 students in 43 classes resulted in a description of effects complicated by the presence of interaction between instructional method and allowed time, so that statements about the relative superiority of the student-directed and teacher-directed approaches must be qualified by specification of allowed time. In any event, the estimated differences were modest, suggesting that the factor of possible achievement differences should not be dominant among the many factors considered in selecting an approach. A very modest ordinal aptitude (ability)-treatment-interaction (ATI) was also found, although the main effect of ability was quite strong. The allowed time effect suggested the possibility of decreased achievement under some circumstances when allowed time is increased, due perhaps to increased misue of time and associated disruption. (Author Abstract)

Descriptors: Research, Academic Ability, Teacher Strategy, Time, Student Achievement

Accession Number: SC 059

Butts, David P. A Summary of Research in Science Education--1979. Athens, GA: University of Georgia, 1980.

Availability:

Order Number: ED 204 102

John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

This review presents a broad perspective of the state of knowledge in science education, a description of existing trends, the areas where research is needed, and tentative answers to persistent problems that have been identified from the research. The review is organized into eight sections. An introductory section describes methods of using research to understand the science learning context. Five following sections focus on research dealing with the elementary school student, the emerging adolescent, the adolescent, the undergraduate college student, and the science teacher. The last two sections deal with measurement instruments used in science education, and an historical perspective relating science education research of 1979 to that of the past and discussing trends and implications for future research. (ERIC Abstract)

Descriptors: Elementary Secondary Education, Higher Education, Science Education, Science Education Research

Accession Number: SC 169 J

Byrd, J. William; and Others. "A Study of Personality Characteristics of Science Teachers". School Science and Mathematics 82, 4 (APR 82): 321-334.

Availability:

Order Number: EJ 262 244

Indiana University of Pennsylvania
P.O. Box 1614
Indiana, PA 15701

Abstract:

In this study, effective teachers were those perceived to be successful by their peers or/and by their students. On the basis of peer evaluation 20 (out of 25) teachers were perceived as successful. On the basis of student evaluation, 17 were identified as being successful, 8 as unsuccessful. Teachers perceived as successful by students tended to be those who used demonstrations, field trips, small group discussions, and classroom methods other than lectures; who scored high on synergy, and capacity for intimate contact; and who had a capacity for "being in touch" with their own feelings. Teachers perceived as successful by their peers were those who used lectures, experiments, demonstrations, discussions, small group activities, and classroom methods other than the use of films.

Descriptors: Teacher Effectiveness, Science Teachers, Student Attitudes, Student Motivation Personality Studies

Accession Number: SC 140

Capie, William; and Fox, Fred W., eds. 1976 AETS Yearbook. Reflections on Science Education. Athens, GA: University of Georgia; and Corvallis, OR: Oregon State University, 1975.

Availability: Order Number: ED 120 012

ERIC Information Analysis Center for Science,
Mathematics, and Environmental Education
The Ohio State University
1200 Chambers Road
Columbus, OH 43212

Abstract:

Fourteen papers compiled by the Association for the Education of Teachers in Science focus on (a) the "mission" of science education, (b) the application of psychological theory to science education, and (c) problems in science teacher education. In the first section, two authors suggest that students are the starting points in planning curricula rather than merely the targets, and affective areas and integrated science in planning learning are being acknowledged. In counterpoint, two other papers suggest that this is not new, but rather just more pressing now, and that rather than science education having a mission, people have missions. In the second section, while psychological theory is underlined as an increasingly large contribution, especially Piagetian theory, it is cautioned that humanistic approaches not be abandonded. In addition, principles of third force psychology are applied to teacher training and public schools, with the advocating of commitment to self-actualization of both children and teachers; this commitment is then translated into some action plans within the grasp of teachers. Papers in the third section emphasize the need for teacher training institution affiliation with public schools, collaboration between small, widely scattered school districts through regional centers, greater roles from teachers themselves in their own inservice, and lastly, capitalizing on the educational analogue of the ecotone of biology (the area where communities meet). Each paper provides references.

Descriptors: Science Education, Science Teachers, Inservice Teacher Education, Science Curriculum, Curriculum Development, Teacher Centers, Integrated Curriculum, Psychoeducational Methods, Secondary School Science, Elementary School Science

Accession Number: SC 130 J

Capie, William; and Tobin, Kenneth G. "Pupil Engagement in Learning Tasks: A Fertile Area for Research in Science Teaching". Journal of Research in Science Teaching 18, 5 (SEP 81): 409-417.

Availability:

Order Number: EJ 251 579

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

This synthesis of research in academic engagement addresses studies in several academic areas. A general relationship of teacher performance and student engagement in learning tasks is noted. More importantly, a substantial relationship between degree of engagement and achievement has been reported in numerous studies. The paucity of engagement studies in science is surprising given the variation in engagement rates in science classrooms. Numerous research questions are suggested for science education researchers. A particularly fertile area for investigation is the categorization of engagement. (Author Abstract)

Descriptors: Engagement, Science, Research, Teacher Performance, Classroom Observation

Accession Number: SC 160

Carey, Helen, ed. Playing with Energy: Classroom Games and Simulations. Washington, D.C.: National Science Teachers Association, 1981.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

This is a collection of five games and simulations for students in grades nine to twelve, all of which deal with energy concepts. The games included have been taken from teacher-written, classroom-tested learning packets developed by a National Science Teachers Association project. The essential components of each game are included. It is assumed that other research, curriculum building, and introductory activities will be conducted for a more comprehensive total plan of teaching. Descriptors of each game include major concept of the game, supporting facts, related science theme, science process skills engaged, method and materials needed. Also included as part of each game are instructional objectives, major concepts, length of playing time, extent of teacher preparation. The games have been selected as interdisciplinary and multifaceted in approach but will put emphasis on the content perspective of the classroom teacher of science.

Descriptors: Science Curriculum, Science Teachers, Simulation Games, Energy, Group Dynamics, Role Playing, Science Education

Accession Number: SC 099

Case, James H.; and Others. The Supply and Demand of Mathematics and Science Teachers in Massachusetts. Boston, MA: Department of Education, 1983.

Availability:

Order Number:

Commonwealth of Massachusetts
Department of Education
Division of Curriculum & Instruction
Boston, MA 02215

Abstract:

This report (partially fulfilling one objective of the Commissioner's Operational Plan for 1983) analyzes the supply and demand of mathematics and science teachers in Massachusetts on the basis of the most recent data available. These data show a temporary statistical surplus of math and science teachers created by layoffs related to Proposition 2½, and that this surplus will become a shortage in two or three years if present trends continue. The shortage could become more serious and more immediate if the demand for math and science teachers increases as a result of changes in graduation or college admission requirements. Suggestions to remedy projected shortages are made. These include: Preservice and inservice programs must be improved and centralized; school-business partnerships must be developed for sharing staff and ideas; forgiveness grants for science graduates must be offerred; teacher salaries must be raised; and the Board of Education must act as a catalyst and disseminator of these proposed remedies.

Descriptors: Teacher Supply and Demand, Science Teachers, Teacher Shortage, State Boards of Education, State Action, School Business Relationship, Preservice Teacher Education, Inservice Teacher Education, Incentive Grants

Accession Number: SC 196

Champagne, A.B. Utilizing Findings of Cognitive Research in Designing Physics Instruction. Pittsburgh, PA: Learning Research and Development Center, 1981.

Availability:

Order Number:

Learning Research and Development Center
The University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Abstract:

"A significant difference between physics experience of experts and novices is that experts have had experiences which require either verbal interactions with others or the organization of physics information for the purpose of communicating it to others". This statement by the author is also the hypothesis for this paper's purpose. The author suggests that student internal mental set or "schema" influences explicit instruction to the degree that little incorporation of new information can be done without distortion unless the effects of solitary practice in problem solving is counteracted. The author further suggests instructional dialogue as a method of constructing cognition of new information which parallels that of extensive practice in problem-solving. The paper is meant as a guide to teachers whose role is stated by the author as moderators of the suggested student dialogues.

Descriptors: Cognitive Psychology, Student Dialogue in Science, Cognitive Constructs, Psychology of Learning, Cognitive Research, Student Misconceptions in Science, Science Instruction, Instructional Methodology

Accession Number: SC 030 P

Champagne, Audrey B.; Gunstone, Richard F.; and Klopfer, Leopold E. Effecting Changes in Cognitive Structues Amongst Physics Students. Pittsburgh, PA: Learning Research and Development Center, 1983.

Availability:

Order Number:

Learning Research and Development Center
The University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Abstract:

A general instructional approach was studied for its ability to affect the schemata of students which lead to an idiosyncratic interpretation of real world events, often resilient to change during formal instruction, especially in the physics area of mechanics. Instruction (occurring over five days) was designed to provide considerable opportunity for arguing one's own interpretations of both specific events and general relationships. Pre- and post-instruction assessments looked at changes in students' cognitive structures with a physics concept classification and categorization task, a semantics task, a word-association task, a concept map test, and a real event task. The two experimental groups were middle school students designated as academically gifted and as having a demonstrated interest in science in Pittsburgh, Pennsylvania, and non-physics-major science graduate students studying to become high school teachers in Victoria, Australia. For the Pittsburgh group, analyses suggested little change in cognitive structures. Perhaps the cognitive abstracts of students of this age are poorly articulated and unstable in terms of propositional knowledge, especially such as the Victoria group showed far more success. Perhaps the latter group also knew more about physics to begin with. At any rate, the Victoria group showed changes of great significance in cognitive structure, and understanding of the origin and resilience of views which caused them to be conceptually troubled by the perspectives advanced in physics courses. Perhaps such change was affected also because of more maturity, ability to debate issues at length, and anxiousness to be introspective about their learning processes.

Descriptors: Physics, Cognitive Processes, Learning Processes, Learning Theories, Cognitive Style, Science Instruction

Accession Number: SC 185 J

Champagne, A.B.; and Klopfer, L.E. "Actions in a Time of Crisis". Science Education 66, 4 (1982): 503-514.

Availability:

John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Order Number:

Abstract:

The actions proposed and outlined in this article are based on (1) an analysis of the federal role in education from the viewpoint of historical determinants, (2) those factors considered by the authors to be influential to education from a Reagan Administration decision policy, and (3) projections, under the same presidential administration, for the federal role in education. Also included is the authors' rationale for support of science education from the point of view of national economy and national need. That view emphasizes a work force with technological skill, an industry sustained by scientific information, and educational attitudes that support the pragmatic considerations of world leadership and science literacy for ordinary citizens. They offer for comparison to science curriculum goals in the United States, a syllabus for Soviet General Education Schools. In conclusion, they urge that the educational community influence actions of federal administration, by lobby and other political action, to increase funding for educational improvement in science.

Descriptors: Educational Needs, Educational Trends, Decision Making, Federal Legislation, Financial Support, Government Role, Science Education

Accession Number: SC 180 J

Champagne, A.B.; and Klopfer, L.E. "A Causal Model of Students' Achievement in a College Physics Course". Journal of Research in Science Teaching 19, 4 (1982): 299-309.

Availability:

Order Number:

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The objectives of the study were (1) to construct a causal model for students' achievement in the mechanics segment of a college physics course, (2) to estimate the structure coefficients that link the model's hypothesized variables and measured variates that contribute to achievement, and (3) to determine the effects on mechanics achievement which the causal model predicts for changes in instructionally manipulatable variates. Methodology utilized explanatory observational research (Cooley, 1978; Heese, 1975; Wold, 1956). The Factorial Model (F & M) procedure was applied to the data to estimate the coefficients of the proposed model's structural equations. Results indicate that the model is plausible and that its first two of three variables (Newtonian physics, math ability, and science experience) account for about 34 percent of the variance in the criterion variate. Implications are discussed. (Author Abstract Modified)

Descriptors: Physics Instruction, Science Research, Student Achievement, Instruction Variables, Science Students

Accession Number: SC 119

Champagne, A.B.; and Klopfer, L.E. Differential Effects of Students' Science Knowledge and Processing Skills in Solving Verbal Problems. Pittsburgh, PA: Learning Research and Development Center, 1980.

Availability:

Order Number:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Abstract:

The study reported in this paper brings analytical techniques of cognitive psychology to bear on an area of continuing interest in science education, namely, developing students' problem-solving ability. Although science educators realized long ago that both knowledge of science concepts and reasoning skills are involved in successful problem solving, exactly how these two components interact remains largely unknown. A parallel theoretical issue in information processing psychology concerns the relative contributions of semantic knowledge and processing skills to the successful solution of different problem types. This paper describes an investigation of the interaction between semantic knowledge and processing skills in students' performance in solving two types of problems of inducing structure, namely, analogies and set-membership problems. Both types of problems utilized the same set of science concepts drawn from the discipline of physical geology. Students' problem-solving performance was assessed prior to, immediately following, and one year after four weeks of instruction in physical geology. The general finding from the study is that, with the semantic knowledge involved in the solution of the two problem types held constant, students' processing skills contribute more to the solution of set-membership problems than to the solution of analogies problems. The theoretical analyses of the problems and details of the empirical confirmation of the hypotheses derived from the analyses are contained in the paper. (Author Abstract)

Descriptors: Cognitive Psychology, Problem Solving, Science Education, Information Processing

Accession Number: SC 118

Champagne, A.B.; and Klopfer, L.E. Using the ConSAT: A Memo to Teachers. Pittsburgh, PA: The Learning Research and Development Center, 1980.

Availability:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Order Number:

Abstract:

In the format of an informal talk with science teachers, this paper describes how the Concept Structuring Analysis Techniques (ConSAT) can be used both as a diagnostic and assessment task for showing how students structure their knowledge and as a tool for teaching science subject matter. The paper shows that the ConSAT operationalizes the philosophical notion of discipline structure and the psychological notion of knowledge structure, so that these notions can be applied in science instruction. In addition to illustrating the use of the ConSAT in teacher-student interactions and in student assessment, the paper's largest section discusses the application of the ConSAT to instruction in reading science text and in composing answers to science problems. (Author Abstract)

Descriptors: Diagnosis, Assessment, Science Teaching, Knowledge Structure, Reading

Accession Number: SC 121

Champagne, A.B.; Klopfer, L.E.; and Donnelly, J. Time Out for Problem Solving. Pittsburgh, PA: Learning Research and Development Center, 1979.

Availability:

Order Number:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Abstract:

Teachers in elementary schools, supervisors of instruction, and other educational practitioners are the primary audience for this publication. The paper presents philosophical, psychological, and practical reasons for including a problem-solving approach in elementary school instruction. It draws on the writings of John Dewey, Jean Piaget, James Greeno, Robert Glaser, Lauren Resnick and others to bring together ideas about problem solving that are useful for the practicing teacher. In addition, the paper contains a detailed illustration of the use of a problem-solving approach to teach elementary school children the important concept of area. (Author Abstract)

Descriptors: Problem Solving, Elementary Education, Cognitive Psychology, Teaching

Accession Number: SC 120

Champagne, A.B.; Klopfer, L.E.; Solomon, C.A.; and Cahn, A.D. Interactions of Students' Knowledge with Their Comprehension and Design of Science Experiments. Pittsburgh, PA: Learning Research and Development Center, 1980.

Availability:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Order Number:

Abstract:

The relationship between students' knowledge about the motion of objects and the students' comprehension of physics instruction is the topic of this paper. Students have considerable knowledge about the motion of objects, some of which is consistent with the physical concepts they are to learn and some of which is not. The inconsistent prior knowledge can hinder learning rather than being a facilitative influence. The paper describes methodologies for systematically describing students' preinstructional knowledge concerning the motion of objects in free fall. A system of propositional analysis, which was applied to students' protocols, is described and illustrated. How the students' preinstructional knowledge about free fall relates to their subsequent learning of mechanics concepts is discussed. The paper should be of interest to cognitive psychologists, science educators, educational researchers, and instructional designers. (Author Abstract)

Descriptors: Misconceptions, Science, Research, Information Processing, Instructional Design

Accession Number: SC 102

Clark, C.M.; and Elmore, J.L. Transforming Curriculum in Mathematics, Science, and Writing: A Case Study of Teacher Yearly Planning (Research Series No. 99). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

An experienced teacher of second grade participated in three two-hour yearly planning sessions, one each in mathematics, science, and writing. The teacher "thought aloud" as she/he planned, and two researchers present at these sessions took written notes. The teacher's methods of yearly planning for mathematics, science, and writing are described and contrasted in terms of a process model of teacher planning. Planning for mathematics and science were more similar to one another than they were to yearly planning for writing. The nature of yearly planning and its possible role as a link between curriculum and instruction are discussed. (Author Abstract Modified)

Descriptors: Elementary Education, Teacher Planning, Process Models, Curriculum, Mathematics, Science, Writing, Instruction

Accession Number: SC 068

Colton, R.W. The Science Program in Small Rural Secondary Schools. Las Cruces, NM: ERIC Clearinghouse on Rural Education and Small Schools, 1981.

Availability:

Order Number: ED 197 913

ERIC Clearinghouse on Rural Education
and Small Schools
Box 3AP
Las Cruces, NM 88003

Abstract:

Rural schools may have an advantage over urban schools in science teaching if sciences are perceived as means of exploring our surroundings, are presented as many viewpoints of one overall picture, and are taught in a form that deals with human situations. Collaboratively taught, rural science curricula can include study of agricultural ecology, rural biology, rural science, rural studies, world food supplies, the energy crisis, and solar energy. Taken as a whole, these courses illustrate an expanded approach to teaching about food production and the life and work of the countryside in general. Such an interdisciplinary approach gives the science teacher the opportunity to help meet some of the educational needs of young people by providing practice in inquiry; calculation and measurement; design; communication; values; and in organizing information, making decisions, and thinking critically. For such a curriculum to be successful, rural science teachers need training and continued financial and resource support as well as flexibility in scheduling. Specific topics are included for each course suggested. (ERIC Abstract)

Descriptors: Agricultural Production, Interdisciplinary Approach, Rural Education, Science Curriculum, Secondary School Science, Teacher Education, Energy Crisis

Accession Number: SC 138 J

Cotham, Joseph C.; and Smith, Edward L. "Development and Validation of the Conceptions of Scientific Theories Test". Journal of Research in Science Teaching 18, 5 (SEP 81): 387-396.

Availability:

Order Number: EJ 251 576

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The purpose of this study was to develop a reliable and valid instrument for use with elementary and secondary teachers of science that would have the following characteristics: (1) sensitivity to alternative conceptions of particular philosophic aspects of scientific theories, and (2) applicability in inferring understanding of the tentative and revisionary conception of the nature of science. This conception, which has educational and social importance, may be a significant influence in the teaching of science as inquiry. Thus, concern with teachers' conceptions of the nature of science and their teaching served as justification for this study. The instrument, which was applied to samples of preservice elementary teachers, college philosophy of science students, and college chemistry students, consisted of items that were adapted to the contexts of particular scientific theories by prefacing them with a brief description of a theory and episodes drawn from its history. Items were written to discriminate between alternative conceptions of the following philosophic aspects of scientific theories: testing, generation, ontological implications, and choice. Evidence in support of the validity of the instrument constructs was obtained using two approaches: discrimination between contrasting groups and the multi-trait and multi-method matrix of Campbell and Fiske. Cronbach aplha reliability coefficients and standard errors of measurement were computed for the instrument and its subtests. Reliability data indicates that an adequate degree of accuracy may be attributed to instrument scores. (Author Abstract)

Descriptors: Tests, Science Theory, Elementary Teachers, Secondary Teachers, Conceptions

Accession Number: SC 035

Cotton, Kathleen; and Savard, William G. Intermediate Level Mathematics and Science Instruction. Research Synthesis. Portland, OR: Northwest Regional Educational Laboratory, 1982.

Availability:

Order Number: ED 222 366

Northwest Regional Educational Laboratory
300 S.W. Sixth Avenue
Portland, OR 97204

Abstract:

An attempt to discover effective instructional and organizational approaches to teaching mathematics and science at the intermediate level reviewed 44 studies and summaries which (1) sought to identify teaching strategies and behaviors positively related to student achievement and effective outcomes; (2) compared a specific instructional approach to one or more approaches; and (3) looked at the relative efficacy of different organization or scheduling arrangements. The research was synthesized by developing brief forms called Item Reports, from which specific issues emerged to form four hypotheses, which were then adjudged supported or not supported by the research in the context of intermediate level students. The four, all supported, were: (1) instruction which features hands-on experiences has a positive effect on mathematics and science achievement of intermediate level students and enhances the attitudes of these students toward the subject matter; (2) the instructional approaches known as direct instruction and mastery learning are more effective than other approaches in promoting math and science achievement and retention, and also foster positive student attitudes; (3) individualized instruction confers greater achievement and retention benefits than does instruction with no individualization; and (4) no one organization or grouping pattern is inherently superior to others for instructing intermediate students in science and mathematics. Recommendations translate these hypotheses into action. A complete bibliography is presented, together with the Item Reports and Decision Displays for each of the 44 reviewed pieces. (ERIC abstract modified.)

Descriptors: Basic Skills, Educational Research, Junior High Schools, Literature Reviews, Mathematical Applications, Mathematical Concepts, Mathematics Curriculum, Mathematics Education, Mathematics Instruction, Middle Schools, Secondary Education, Secondary School Mathematics, Secondary School Science

Accession Number: SC 071 P

Crawley, Frank E.; and dos Santos Silva, Maria Virginia. Development of a Decision-Making Model for Designing a Methods Course for Prospective Secondary Science Teachers: A Delphi Study. Austin, TX: University of Texas at Austin, 1980.

Availability:

Order Number: ED 187 521

Science Education Center
University of Texas at Austin
Austin, TX 78712

Abstract:

Presented are the results of a Delphi study designed to determine the objectives of secondary science methods courses and the concerns of the professors who plan them. The results present, in the order of importance, the three following concerns: (1) planning one or more science lessons, (2) constructing a classroom evaluation scheme, and (3) designing remedial activities for students who lack prerequisite skills for a given set of objectives. Implications and applications of the information are discussed. (Author/ERIC Abstract)

Descriptors: Educational Research, Methods Courses, Preservice Teacher Education, Science Education, Science Teachers

Accession Number: SC 027 J

"The Crisis in Secondary School Science and Mathematics Education". NCSIE Inservice, (WIN 83) (Entire Issue)

Availability:

National Council of States on
Inservice Education
Syracuse University
123 Huntington Hall, 150 Marshall St.
Syracuse, NY 13210

Order Number:

Abstract:

This issue of the National Council of States on Inservice Education presents several articles underscoring the need for more thoroughly educated science and mathematics teachers. The first article, "The Crisis in Secondary School Science and Mathematics Education" is based on testimony presented on May 18, 1982 before the U.S. Government for science education appropriations by Sara E. Klein, Bill G. Aldridge, and James Shymansky. A summary of data drawn from the ASCUS Survey conducted by James N. Akin looks at recent teacher supply and demand. Finally, Trevor G. Howe and Jack A. Gerlovich's piece on "Science and Math Teachers: A National Survey of Supply and Demand" is followed by a report on the American Federation of Teachers (AFT) and the AFL/CIO's tackling of math and science education problems.

Descriptors: Science Instruction, Science Teachers, Teacher Supply and Demand, Mathematics Teachers, Mathematics Instruction, Occupational Surveys

Accession Number: SC 153

Doran, Rodney L. Basic Measurement and Evaluation of Science Instruction. Buffalo, NY: State University of New York at Buffalo, 1980.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

The book is designed to enhance teacher competencies in the assessment and evaluation of science programs in order to facilitate development of more comprehensive ones. It is designed also for relevant assessment and evaluation of student outcomes specific to achievement. Included as major issues are recent trends in changes in available techniques for tests (diagnostic, criterion-referenced, minimum-competencies, etc.) as well as evaluation methodologies; separate assessment techniques for planning outcomes in the cognitive, affective, and laboratory domains; mechanical methods for test construction; item and test analysis methods; descriptive statistics appropriate to science teaching; and alternate systems of grading. Illustrations are provided for most ideas presented as well as information background for the current methods suggested.

Descriptors: Evaluation, Assessment, Science Programs, Science Teachers, Curriculum Development, Science Tests, Test Construction, Science Affective Domain, Science Cognitive Domain, Science Laboratory Assessment, Science Student Profile, Test & Measurements

Accession Number: SC 158

Downs, Gary E; and Gerlovich, Jack A., eds. Science Safety for Elementary Teachers. Ames, IA: The Iowa State University Press, 1983.

Availability:

Iowa State University Press
Ames, IA 50010

Order Number:

Abstract:

This is a methods manual for acquainting a classroom teacher or other school personnel working in a classroom with strategies for the safe teaching of science. The author cites safety management, safety sciences, and safety education as three major components of safety maintenance in the teaching of science. General issues for author discussion include statistical background about accicents and alternate methods of reporting, as well as first aid methods. One chapter and several sections of other chapters focus on aspects of legal liability. Other topics for inclusion are eye protection, science safety for handicapped students, fire protection, plant facilities, chemicals and their use, physical and plant sciences. The manual is written in outline form and reflects technical aspects of maintenance and of responsibility for safety in non-technical terms.

Descriptors: Teacher Behavior, Science Laboratories, Elementary School Science, Leaders Guides, Safety, Laboratory Safety

Accession Number: SC 019

Dunfree, Maxine. Elementary School Science: A Guide to Current Research. Washington, D.C.: Association for Supervision and Curriculum Development, 1967.

Availability:

Association for Supervision and
Curriculum Development
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

Order Number:

Abstract:

This booklet summarizes innovations and research in science education, objectives, curriculum development, methods, materials, evaluation, and teacher education. The guide is aimed at teachers and curriculum workers who do not have time to locate and assemble needed studies. Fresh approaches, objectives, and curricula for elementary science education are reviewed. Studies on children's science learning and interests are investigated with attention to the development of children's science concepts through the works of such people as Piaget, McCollum, and Pollack. A look at teaching and evaluation in elementary science focuses on studies of individual children's differences, learning experiences, inquiry and discovery through experimenting, and performance evaluation. Analyses of new science instruction materials, such as radio, television, films, and textbooks are set forth. Finally, thoughts about improving teacher education are projected, with mention of works by such researchers as Washton, Gemmill, Butts, and Uffelman. An extensive bibliography is appended.

Descriptors: Science Instruction, Research, State of the Art Reviews, Elementary Education, Science Education, Science Curriculum

Accession Number: SC 103

Eaker, R.E.; and Huffman, J.O. Teacher Perceptions of Dissemination of Research on Teaching Findings (Occasional Paper No. 41). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

The study examined the perceptions of 105 teachers regarding research-on-teaching findings as a resource for instructional improvement. The teachers filled out a 40-item, Likert-scale questionnaire about their perceptions. Teachers value research findings that focus on classroom instruction, found the authors, and teachers think that research findings have practical, classroom application. The questionnaire also asked the teachers how effective they thought each of the following delivery systems was at getting research findings to classroom teachers: principals, supervisors, inservice programs, teacher education programs, college and university professors, professional journals, and professional meetings. The teachers thought professional journals an excellent source of research information, but were not as pleased with the research dissemination done by principals, supervisors, faculty meetings, inservice meetings, and professional meetings. Generally speaking, grade-level assignment, degree earned, and number of years experience had little effect on the teachers' perceptions. (Author Abstract)

Descriptors: Teachers' Perceptions, Instructional Improvement, Research, Principals, In-Service Education, Research Applications

Accession Number: SC 111

Eaton, J.F.; Anderson, C.W.; and Smith, E.L. Students' Misconceptions Interfere with Learning: Case Studies of Fifth-Grade Students (Research Series No. 128). East Lansing, MI: Institute for Research on Teaching, 1983.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

Students' misconceptions about scientific topics affect the ways that students understand and respond to classroom science instruction. This study examines the relationship between student misconceptions and learning by focusing on six fifth-grade students as they attempt to make sense of classroom instruction on light and seeing. Pretests, posttests, and classroom observation narratives served as student data. The students' pretests indicate that the students held the misconception that we see because light illuminates things; they did not understand the role of reflected light in vision. The posttests indicate that five of the six students still did not understand how light enables seeing by the end of the unit. Although good teachers (two were observed) used a popular text (Laidlaw's Exploring Science), the instruction was not successful in that conceptual change did not occur; most of the students did not forsake their misconception in favor of the scientific conception. Furthermore, the students' belief in the misconception prevented them from fully understanding other topics covered in the unit, such as the functioning of various eye parts. Conceptual change did not occur because student misconceptions were not addressed in either the text or classroom instruction. Instead, students were taught and learned facts about light and facts about seeing. Many of them had difficulty making sense of these facts and seeing how they are connected to each other, as their answers on the posttest showed. The authors suggest that teachers be made aware of likely student misconceptions so they can work to change them. (Author Abstract)

Descriptors: Students' Misconceptions, Science Instruction, Optics, Conceptual Change, Teaching/Learning, Research

Accession Number: SC 195 J

Ekern, Frances F.; and Others. "Bias in the Science Classroom". American Biology Teacher 44, 5 (MAY 82): 295-297, 305.

Availability:

Order Number: EJ 263 644

National Association for Biology Teachers
11250 Roger Bacon Drive
Reston, VA 22090

Abstract:

The content of the article questions the basis on which science curriculum is planned and natural science should be taught. The authors state that the existence of bias in the teaching of science is not unusual since both teachers and students bring with them past experiences which give them a subjective and, therefore, biased view. They state that bias can be used by teachers and students as a tool for questioning and testing past experience in the "search for truth" as a learning goal. Specific to the point is the discussion of creationism as a subject matter appropriate to equal time as another science course. The authors argue that equal time emphasis is not necessarily appropriate to science teaching. They argue that the requirement of giving all demonstratable solutions to any one problem could also require that all students find the same best solution to a problem. They state the need for student encouragement to investigate a search for their own truth in the probability of expansion of knowledge.

Descriptors: Science Teaching, Natural Science, Education in Bias, Curriculum Creationism

Accession Number: SC 132 J

Fisher, Darrell L.; and Fraser, Barry J. "A Comparison of Actual and Preferred Classroom Environments as Perceived by Science Teachers and Students". Journal of Research in Science Teaching 20, 1 (JAN 83): 55-61.

Availability:

Order Number: EJ 273 490

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

This study of perceptions of classroom environment is distinctive in that, first, it made use of two instruments (the Individualized Classroom Environment Questionnaire and Classroom Environment Scale) which have had very little use in prior science education research and, second, it involved assessment not only of student perceptions of actual environment, but also of student perceptions of preferred environments and teacher perceptions of actual environment. Administration of these instruments to a sample of 2,175 junior high school students in 116 classes revealed that the environment scales exhibited satisfactory internal consistency reliability and discriminant validity in each of the three forms (student actual, student preferred, and teacher actual), and that there were some fascinating systematic differences between the profiles of environment scale scores obtained for the different forms. In particular, it was generally found that students preferred a more favorable classroom environment then was perceived as being actually present and that teachers perceived the environment of their classes more favorably than did students in the same classrooms. (Author Abstract)

Descriptors: Classroom Environment, Science Teaching, Research, Student Perceptions, Teacher Perceptions

Accession Number: SC 062

Flowers, Anne. Addressing Teacher Shortages. A Testimony Given to the House Subcommittee on Elementary, Secondary, and Vocational Education Chaired by Congressman Carl D. Perkins and the House Subcommittee on Post-secondary Education Chaired by Congressman Paul Simon. Statesboro, GA: Georgia Southern College, 1982.

Availability:

Georgia Southern College
Statesboro, GA 30458

Order Number: ED 220 468

Abstract:

The shortage of qualified mathematics and science teachers is a problem likely to grow in the coming decade, reflecting teacher shortages in other subject specialties. In 1981, almost five times more science and mathematics teachers left to take nonteaching jobs than did teachers in other disciplines. Replacements for these teachers are often inadequately qualified. Since shortages exist in other areas, especially in special education, a need is seen for a comprehensive approach to the problem. An emergency or provisional certificate is an inappropriate response, for while arts and science graduates are well prepared in their own fields, they often lack sound training in teaching methods. The proposals to expand the loan forgiveness provisions of the existing National Direct Student Loan program (NDSL), or to create a new program-modeled on NDSL for mathematics and science teachers, will be successful long range strategies for recruiting prospective teachers. However, there is an immediate need to establish teacher fellowships for qualified students who agree to a minimum commitment as classroom teachers. States and school districts should be encouraged to provide pilot programs which stress cooperation among schools, universities, and industry. There should be sufficient funding for basic and applied research into mathematics, science, education, and technology as they are translated into programs for elementary and secondary school children. In addition, teachers should be offered sabbaticals and stipends to pursue further training, while business, industry, and institutions of higher education should be given incentives, through tax credits or other means, to provide appropriate learning opportunities for teachers. Support systems are needed to provide assistance to new teachers during their critical first years. (ERIC Abstract)

Descriptors: Faculty Mobility, State Federal Aid, Teacher Persistence, Teacher Shortage

Accession Number: SC 055 P

Flowers, John D. A Governance Model for In-Service Science Teacher Education. Augusta, GA: Augusta College, 1980.

Availability:

Order Number: ED 196 718

Augusta College
2500 Walton Way
Augusta, GA 30910

Abstract:

Presented is a governance model for in-service science teacher education which was implemented at a four-year college by a committee of classroom teachers, scientists, and county curriculum coordinators. The model accounts for three major dimensions of the curriculum development process: (1) specification of learner objectives, (2) implementation of instructional and learner activities, and (3) formative and summative evaluation. Each dimension of the curriculum development process contained three areas addressed by the governance committee: (1) tasks to be completed by subject matter specialists, (2) tasks to be completed by the governance committee as a whole, and (3) interaction or discussion of policy and curriculum development process. Details are given for the application of the governance model through a National Science Foundation funded institute at Augusta College in Georgia. (Author/ERIC Abstract)

Descriptors: Elementary School Teachers, Inservice Teacher Education, Models, Science Teachers

Accession Number: SC 077

Flowers, John D. Science Teacher Competencies in the Middle School. Augusta, GA: Augusta College, 1981.

Availability:

Order Number: ED 202 673

Augusta College
2500 Walton Way
Augusta, GA 30910

Abstract:

The nature of generic teacher competencies is described with specific reference to competencies endorsed by the Georgia State Department of Education. Several sources of generic competencies for middle school teachers are also identified and discussed. In addition, five generic competencies of science teachers are presented. A synthesis of middle school and science teacher generic competencies is presented in three categories, namely, planning, implementation, and evaluating. The synthesis provides researchers and supervisory personnel with a partial listing of middle school science teacher competencies. (Author/ERIC Abstract)

Descriptors: Competence, Middle Schools, Science Teachers, Teaching Skills

Accession Number: SC 011 J

Fuller, Robert G. "Solving Physics Problems--How Do We Do It?" Physics Today 35, 9 (SEP 82): 43-47.

Availability:

AIP
335 E. 45th Street
New York, NY 10017

Order Number: EJ 268 880

Abstract:

A noticeable decline in students' ability to solve physics problems, their overt misconceptions of natural laws, and increases in information processing research have contributed to interest in how physics problems are solved and then how solutions can be constructed. Expert physics problem solvers seem to approach solutions through a process of successive refinements, and appear to organize their knowledge into large, coherent "chunks" of information, more accessible than individual principles and equations. The D, P, I, C strategy would encourage students to describe (D) the problem, pictorially and verbally, to ensure their understanding of it. Next, planning (P) a solution with equations and algebraic relationships, then implementing (I) the plan of solution with numerical values assigned to equations, and checking (C) the result complete a fully organized approach to problem solving. Piaget and others have suggested the constructivist approach, a dynamic interaction model of assimilation - accommodation - equilibration as the way knowledge and problem-solving strategies are constructed. This self-regulation process looks to the dynamic interaction between peoples' minds and their external experiences, where new understandings and new strategies develop to interpret experiences which do not fit mental preconceptions. Such periods of disequilibration are fertile for intellectual growth. In this model, physics teachers should provide for student analysis those experiences that are not likely to match the students' preconceived ideas of natural behavior.

Descriptors: Physics, Problem Solving, Discovery Processes, Student Needs

Accession Number: SC 095 J

Gabel, Dorothy L.; and Sherwood, Robert D. "High School Science Courses Do Make a Difference". School Science and Mathematics, 81, 6 (OCT 81): 502-506.

Availability:

Order Number:

Indiana University of Pennsylvania
P.O. Box 1614
Indiana, PA 15701

Abstract:

The question studied was whether or not the number of high school science courses elementary education students took makes a difference in the acquisition of science concepts and skills that help prepare them to teach elementary science. During the fall of 1979, 113 preservice elementary teachers enrolled in a required Basic Science Skills course with one lecture and two 2-hour lab sessions per week coverning life and physical science, astronomy, and geology. Instruments administered during the course to predict success included a demographic data questionnaire, a fraction and decimal test, a mathematics anxiety test, a proportional reasoning test, content achievement tests, and a lab practical. Success in the course was measured by the sum of the scores on the two latter tests, used as dependent variables for regression equations. Scores on the four former tests were used as predictors. The best predictor of students' achievement of facts and concepts taught in the course was their score on the fractions and decimal test. However, the best predictor of success for the lab practical was the number of high school science courses. Students successful on the practical should be able to plan and carry out experiments in the classroom. Thus, perhaps students' acquisition of these important skills is improved by their having taken more science courses in high school.

Descriptors: School Role, High Schools, Science Instruction, Science Education, Preservice Teacher Education, Elementary School Teachers, Elementary School Science, Secondary School Curriculum, Science Curriculum

Accession Number: SC 165

Gallagher, James J. A Summary of Research in Science Education for the Years 1968-69, Elementary School Level. Columbus, OH: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1971.

Availability: Order Number:

ERIC Information Analysis Center for Science,
Mathematics and Environmental Education
The Ohio State University
1800 Cannon Drive
Columbus, Ohio 43210

Abstract:

This review includes 120 research reports related to elementary school level instruction in science. Criteria for inclusion were: perceived significance of the question, validity of research design, data interpretation, and adequacy of reporting. The reports are divided into the following nine studies categories: teacher behaviors and characteristics, teacher education, instrument development, cultural influences on intellectual development and science learning, developmental studies without instruction, impact of instruction (pre-school and primary), impact of instruction (intermediate grades), effects of instruction of new elementary science programs, and miscellaneous studies. Each category includes an author summary of findings. Also included is a final conclusive review of all research reports reviewed. The author cites weaknesses in most studies of elementary science programs. He describes them as somewhat lacking in data presentation, quality of reporting, and logical development. He urges the use of sharp focus and greater rigor in research in elementary science education.

Descriptors: Science Instruction, Science Teachers, Elementary Science, Research in Science, Curriculum Development

Accession Number: SC 015 J

Gerlovich, Jack A. "Safety Tips: Avoiding Negligence Suits in Chemistry Teaching". Journal of Chemical Education 60, 4 (APR 83): 358-359.

Availability:

Order Number:

Journal of Chemical Education
119 W. 24th Street
4th Floor
New York, NY 10011

Abstract:

Negligent behavior by chemistry teachers is conduct which falls below a standard of performance established by law to protect others against an unreasonable risk of harm. To avoid chemistry teacher negligence suits, the following considerations should be taken. State and local laws and regulations concerning liability, insurance protection, chemical storage, fire codes, and eye protective equipment should be understood. All potential safety hazards, faulty equipment, hazardous incidents, and accidents should be reported to administrators. Adequate records of accidents should be kept until statutes of limitations in the State have expired. All student activities should be carefully planned, and instructions and supervision should be age and activity appropriate. Regular inventories of equipment and chemicals should be made. Lab safety procedures and precautions should be in writing, distributed to students, and displayed prominently in classrooms and laboratories. Moreover, contributory vs. comparative negligence should be understood within the context of the State's statutes, in that such understanding can help with defense tactics once litigation is proceeding. In the former, the student can be assessed for his or her contribution to the tort situation, while in the latter, the percentage of blame of each party can be assessed and affect awards or penalties from the jury.

Descriptors: Chemistry, Chemical Reactions, Teacher Responsibility, Torts, Legal Responsibility, Court Litigation

Accession Number: SC 016

Gerlovich, Jack A. Summary of a State Plan for Elimination of Dangerous/ Unwanted Chemicals. Des Moines, IA: Iowa Department of Public Instruction, n.d.

Availability:

Order Number:

State of Iowa
Department of Public Instruction
Grimes State Office Building
Des Moines, IA 50319

Abstract:

The Iowa Department of Education, the State Department of Environmental Quality, the State Fire Marshall's office, and local schools combined efforts to produce this list of 100 chemicals considered more hazardous than their educational value for school science laboratories. Along with this list, they developed suggestions for their evaporation, dilution, neutralization, open burning, remote detonation, redistribution to colleges and universities, or disposal in an approved landfill. Provided in this article are details for contacting professional chemists (their addresses and telephone numbers) about chemicals identified as hazardous, an outline of recommended procedures for disposal, the telephone response sheet the chemist will use, and identification of the departments and agencies available to handle the list of chemicals appended.

Descriptors: Chemical Reactions, Chemistry, Science Teachers, Responsibility, Safety, Accident Prevention

Accession Number: SC 032

Gerlovich, Jack A.; and Downs, Gary E. Better Science Through Safety. Ames. IA: Iowa State University Press, 1981.

Availability:

Order Number:

The Iowa State University Press
Ames, IA 50010

Abstract:

The Iowa Department of Education presentation of safety procedures and precautions for science teachers and classrooms opens with an emphasis on the three components of an effective school safety program: safety management, safety education, and safety services. An analysis of legal liability then covers negligence in tort law, reasonable and predent judgment, teacher duties, and case studies. Main chapters go on to cover eye protection and eye care, safety specifically in biology settings (with lists of plants and animal dangers), in chemistry settings (with listings of hazardous chemicals and combinations thereof), in physics settings, during field activities, during student research projects, and in the physical plant and facilities. Attention is given to science safety for handicapped students, and to accident and incident reporting systems. Appendices provide checklists, examples of eye protectors, instructions for explosion-safe refrigerators, safety equipment, and the first aid procedures. Three cards provided with the book allow for posting important emergency telephone numbers and quick reference to crucial parts of the book in emergencies.

Descriptors: Science Laboratories, Science Projects, Science Instruction, Science Equipment, Safety, Safety Equipment, Accident Prevention, First Aid

Accession Number: SC 012 J

Gerlovich, Jack A.; Downs, Gary; and Magrane, George. "How Essential is Science at the Elementary Level?" Science and Children 19, 3 (NOV/DEC 81): 22-24.

Availability:

Order Number:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

Numerous surveys and articles in the late 1970's and into the 1980's have contrasted the lack of science education in elementary schools with the increasingly technological nature of the late 20th century. The Iowa Department of Public Instruction developed a K-12 science curriculum for teachers who felt they were not qualified to do so. This curriculum acts as a modified pyramid, with the majority of process skills, content and contemporary issues introduced at the K-6 level. Planned, sequential introduction of the objectives forms the basis for advanced science education, while assuring relevance and eliminating duplication. In the later grades, 7-12, the objectives and content can be elaborated and detailed. This or some similar method is essential to produce scientifically literate citizens. The breakdown of recommended grade levels, objectives, and timing for objectives introduction and objectives emphasis are pictured and references are provided.

Descriptors: Science Instruction, Curriculum Development, Elementary Education, Relevance (Education), Science Curriculum

Accession Number: SC 018

Gerlovich, Jack A.; and Unruh, Roy. Applying Technology to Alleviate the Problems Created by the Shortage of "Qualified" Mathematics and Science Teachers. Des Moines, IA: Department of Public Instruction and Cedar Falls, IA: University of Northern Iowa, n.d.

Availability:

Order Number:

State of Iowa
Department of Public Instruction
Grimes State Office Building
Des Moines, IA 50319

Abstract:

With the loss of physics, chemistry, and mathematics teachers to higher paying jobs, the Iowa Department of Public Instruction sought to develop measures for attracting more college students to the profession and enriching the curriculum and inservice for teachers drafted as a stopgap measure into these disciplines. Through the fall of 1982 and early 1983, written materials focusing upon student application of content to contemporary problems were pilot-tested. In early 1983, a physics task force initiated an interactive telephone system--a telelecture program--to upgrade teachers in physics content, to familiarize them with application activities, and to demonstrate software and vido materials. Pilot schools' physics classrooms were provided a telephone and amplifier, the teachers received a guide for conducting application activities and outlining the mathematics involved. A university physics specialist confered with teachers at each unit's start. Total costs per school ranged from $335 to $635 (computer modems or software ranging from $200 to $500). In 1983, the state of Iowa responded to these efforts with supporting funds through 1985, both for the telelecture program and for loan forgiveness incentives to graduates in science and math education. Application of the telelecture system to foreign language instruction is implicated. Numerous tables in this monograph trace the decline of supplies of science teachers in Iowa.

Descriptors: Science Instruction, Physics, Mathematics, Incentives, Teacher Recruitment, Teacher Education, Science Teachers, Telephone Instruction

Accession Number: SC 048 P

Gooding, C. Thomas; and Swift, J. Nathan. Modifying Teacher Questioning Behavior in Classroom Interaction. Oswego, NY: State University of New York at Oswego, 1982.

Availability:

Order Number: ED 214 769

State University of New York
at Oswego
Oswego, NY 13126

Abstract:

This project investigated the effects of increasing teachers' wait times on general questioning skills in science teaching. Variables were separated through the use of four treatment groups, each containing ten science teachers. Schools were randomly assigned to four treatment conditions from a subsampling of middle schools in a central New York state county. One group received instruction in wait time using a newly developed electronic feedback device that monitors the duration of teacher and student pauses; a second received general questioning skills instruction; a third received both types of instruction; and a comparison group received no instruction of either type. Use of written materials on questioning produced only a slight increase in teacher wait times, but feedback devices caused significant increases. Interaction effects were found significant favoring those who had access to the devices without the additional complication of reading the written materials. Treatment effects were maximized at the project's fifth week, and diminished as the school year's end approached. The greatest behavior change noted in analysis was the increase in the amount of total classroom discussion time with active student participation. (ERIC Abstract)

Descriptors: Questioning Techniques, Science Education, Science Instruction, Teaching Methods, Science Education Research, Wait-Time

Accession Number: SC 002

Gould, Stephen Jay. The Mismeasure of Man. New York, NY: W.W. Norton & Company, Inc., 1981.

Availability:

Order Number:

W.W. Norton & Company, Inc.
500 Fifth Avenue
New York, NY 10110

Abstract:

This book seeks to demonstrate both the scientific weaknesses and political contexts of biological determinist arguments, such determinism holding that differences between human groups (primarily races, classes, and sexes) arise from inherited inborn distinctions. Measuring intelligence as a single quantity (and as the single determinator of worth) through craniometry and certain styles of psychological testing is projected as a social phenomena, where questions often are formulated in such a restricted way that any legitimate answer can validate a social preference. The skull collection of the Philadelphia physician, Samuel George Norton, is discussed as an example of the most extensive data compiled before Darwin to rank races by the sizes of their brains. The flowering of craniometry as a rigorous and respectable science in Paul Broca's late nineteenth century European school is accompanied by the highlighting of the impact of quantified approaches to human anatomy in that century's determinism, through two case studies: the theory of recapitulation of evolution's primary criterion for unilinear ranking of human groups, and the attempt to explain criminal behavior as a biological atavism reflected in the apish morphology of murderers and other miscreants. The invalid approach of twentieth century intelligence testing is discussed through a breakdown of the hereditarian version of the IQ scale as an American product and the argument for reifying intelligence as a single entity by the mathematical technique of factor analysis. A positive conclusion looks to how such myths can be debunked and celebrates the miraculous flexibility of human nature.

Descriptors: Racial Bias, Racial Differences, Racial Attitudes, Racial Discrimination, Cultural Influences, Sex Bias, Sex Discrimination, Sex Differences, Physical Sciences, Physical Characteristics, Intelligence Tests, Intelligence Differences, Intelligence Quotient, Genetics, Social Bias, Nature-Nurture Controversy

Accession Number: SC 003

Gould, Stephen Jay. The Panda's Thumb. New York, NY: W.W. Norton & Company, Inc., 1982.

Availability:

Order Number:

W.W. Norton & Company, Inc.
500 Fifth Avenue
New York, NY 10110

Abstract:

Exploration of evolutionary theory in this collection of essays delves into the richness of both natural history's particularities and its potential union of underlying explanation. Darwin's thought and impact upon natural science pull together a diverse range of subjects: the discovery of magnetic bacteria, the buttressing of racism through distorted scientific proof of polygeny, women's inferiority as proven through the farce of craniometry, and the significance of the Panda's thumb in eating habits and species development. Essays on dinosaurs, turtles, marsupials and anglefish argue the paradox that evolution certainly occurred but that its proof lies in imperfections that reveal history. Writings on Darwinian theory, the meaning of adaptation, the tempo and mode of change, the scaling of size and time as major evolutionary themes are sandwiched between studies of the peculiarities of organisms' histories. Science as embedded in culture is highlighted to bring it forth as an accessible, human activity. Meanwhile, it is shown that Darwinism cannot necessarily be squared with hopes for intrinsic harmony or progress in nature. And it is proposed that a multiplicity of mechanisms in nature preclude the explanation of higher level phenomena by the model of adaptive gene substitution favored for the lowest level.

Descriptors: Science History, Biological Sciences, Biology, Evolution, Biological Influences, Anatomy, Physiology, Human Body, Zoology

Accession Number: SC 162

Greeno, James G. Skills for Representing Problems. Pittsburgh, PA: University of Pittsburgh, 1983.

Availability:

The University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Order Number:

Abstract:

The paper deals with the solving of problems, especially those of mathematics and science from the task-analysis point of view. The model uses any task considered significant to instruction and the analysis of processes and structures which appear to be sufficient for the successful performance of the task selected. The task analysis is cognitive and includes both behavioral performances, and internal knowledge structures and processes required for successful behaviors. The author outlines the task of a student to be of three general parts: (1) understanding of the problem, (2) expression of the problem in some form, and (3) solving of the problem. This paper focuses on construction of semantic representation of the problem as critical to initial understanding of it as the problem. Representation of the problem is considered by the author to be an intermediate one, often found lacking in most student instruction. He stresses the importance of identification of relevant quantities into appropriate patterns to make problem setting procedures for relating such quantities. He encourages the use of instruction to improve these processes as explicit to problem solving instruction.

Descriptors: Curriculum, Science Instruction, Science Teachers, Math Instruction, Problem Representation, Task-Analysis, Cognitive Structuring

Accession Number: SO 128 P

Greeno, James; Glaser, Robert; and Newell, Allen. Research on Cognition and Behavior Relevant to Education in Mathematics, Science, and Technology. Pittsburgh, PA: Learning Research and Development Center, 1983.

Availability:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Order Number:

Abstract:

This paper summarizes a report based on a hearing organized by the Federation of Behavioral, Psychological, and Cognitive Sciences for the National Science Board Commission on Precollege Education in Mathematics, Science, and Technology. The purpose of the report is to provide the NSB Commission with information about recent advances in cognitive and behavioral science relevant to education in mathematics, science, and technology, as well as prospective contributions from these fields if adequate levels of support are available. In this summary paper are discussed some of the major recent contributions and topics for further fruitful research that are considered in the full report. (Author Abstract Modified)

Descriptors: Psychology, Mathematics, Science, Technology, Research, Research Needs

Accession Number: SC 178 J

Gunstone, R.F.; Champagne, A.B.: and Klopfer, L.E. "Instruction for Understanding: A Case Study". The Australian Science Teachers Journal 27, 3 (1981): 27-32.

Availability:

HEARU
Monarch University
Clayton, Victoria 3168
Australia

Order Number:

Abstract:

The article describes author attempts to help students reconcile pre-instruction ideas of force and motion with the physicist's view of the same phenomena. It is the stated belief that students continue to interprete the real world in a way more Aristotelian than Newtonian,even after successfully passing physics courses tests which included a Newtonian view of force and motion. Ten eighth-grade students and two seventh-grade students were coming to science instruction with the authors for eight, once-a-week sessions. This article offers a description of those sessions and some issues emerging from them, which are described here as having importance to the teaching of physics. Of prime importance is discussion as a vehicle for clarification and precision of intent in language. Example is given of the way by which text and teacher information can be misapplied if language precision is not stressed.

Descriptors: Preconceptions in Science, Cognitive Process in Science, Science Curriculum, Science Teachers, Student Achievement, Dialogue, Group Dynamics in Science

Accession Number: SC 179 J

Guthrie, James W.; and Zusman, Ami. "Teacher Supply and Demand in Mathematics and Science". Phi Delta Kappan 64, 1 (SEP 82): 28-33.

Availability:

Order Number: EJ 268 272

Phi Delta Kappan
Eighth Street and Union Avenue
Box 789
Bloomington, IN 47402

Abstract:

Not enough teachers are currently being trained to remedy the already critical problem of teacher shortages in math and science as indicated by the small number of students enrolled in teacher training programs in math and science. The author claims that money is at the root of the problem, general to the teaching profession, and specific to teachers of science and math. Solutions to the problem include differential pay to these teachers; inservice staff development; cooperative efforts of schools and industry; an improved working environment to attract needed teachers; research on precocious students such as is already being done at John Hopkins, the University of Arizona, and California at Berkley; teacher-linked loans; and computer assisted instruction.

Descriptors: Gifted Education, Science Teachers, Teacher Preparation, Teaching Loans, Shortages in Teaching

Accession Number: SC 190 J

Haladyna, Tom; and Others. "Relations of Student, Teacher, and Learning Environmental Variables to Attitudes Toward Science". Science Education 66, 5 (OCT 82): 671-687.

Availability:

Order Number: EJ 268 884

John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The article's purpose is the description of possible determinants of attitudes toward science as subject matter. The instrument of testing, the Inventory of Affective Aspects of Schooling, was developed from a self-report attitude inventory, the Learning Environment Inventory (Anderson and Walberg, 1976) and Classroom Environment Scales (Moos and Trickett, 1974). Findings indicated that attitudes toward science are strongly related toward students' sense of the importance of science and their level of fatalism. Variables of fatalism and self-confidence, as they relate to science, math, and social studies, imply, for the author, a causal link to perceptions of self and ability. High relationships appeared between positive attitude science and teacher qualities of enthusiasm, respect for teacher knowledge, teacher support for students, teacher praise, teacher commitment to learning, and fairness to students. Learning environment was indicated as highly related to attitude toward science in terms of satisfaction with work performed, organization of instruction, and positive class climate.

Descriptors: Affective Instruction, Student Attitude, Science Classroom Environment, Teacher Characteristics, Fatalism, Learning Environment, Environmental Variables

Accession Number: SC 098

Hall, Gene; and Fox, Fred, eds. 1977 AETS Yearbook. Science Teacher Education: Vantage Point 1976. Columbus, OH: ERIC/SMEAC Information Reference Center, 1977.

Availability:

Order Number: ED 032 035

ERIC/SMEAC Information Reference Center
The Ohio State University
1200 Chambers Road, 3rd Floor
Columbus, OH 43212

Abstract:

This Yearbook's collection of papers looked at recent science education successes, current resources and needs, and projections for future planning. "Realities of the times in Science Teacher Education", by Jim Barufaldi, outlines the past 75 years' of growth and the present task of facing social, political, and economic issues. Gene Craven's "Preservice Science Teacher Education" highlights competency-based teacher education, and proposes a humanistic approach, an integrated program, and inner- and outer-city oriented approaches. Alan M. Voelker's "Inservice Science Teacher Education" describes Japanese teacher centers and suggests a local approach, a State network, and a national endeavor. "Science Supervision: Form and Function", by Bill McIlwaine and Bob Zeigler concentrates on the field's neglect of the issues of and the potential of supervision. "Doctoral Programs for Science Educators", by David Butts surveys such programs around the country. Mary Budd Rowe's "In Pursuit of Quality: Research on the Education of Teachers" underlines themes of caring and quality teaching in exploration of the strategies of pausing, questioning and interaction, and in study of self-direction vs. instructor-direction, of personality characteristics, and of classroom attitudes. "Science, Society and Education at the Crossroads: On Learning How to Make Love in a Liferaft", by David Newton fantasizes about new world views of science, society, and schools. Synthesizing from the foregoing, Howard Jones writes "The Past, Present and Future of Science Education Before, During, and After the Year of the Golden-Fleeced Macos".

Descriptors: Science Instruction, Science Education, Science History, Science Supervision, Science Education History, Preservice Teacher Education, Inservice Teacher Education, Teaching Methods

Accession Number: SC 081

Harbeck, Mary Blatt, ed. The 2nd Sourcebook for Science Supervisors. Washington, D.C.: National Science Supervisors Association, 1976.

Availability:

Order Number:

National Science Supervisors Association
National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

To assist science supervisors in improving student learning the following papers are offered in this compilation: "A Performance Model", by Jon R. Hendrix; "The Role of the State Science Supervisor", by Gary E. Downs; "Working with Teachers", by Mary B. Harveck; "Working with Administrators", by Phillis L. Magat; "Providing the Learning Environment", by Rodger W. Bybee; "Preparing for and Implementing Change", by Albert F. Eiss; "Implementing Curriculum Changes", by Charles Butterfield; "Evaluating Science Programs", by Janet Wall; "Getting Materials Into Teachers' Hands", by Gary Huffman; "Developing Local Curriculum Reform", by Donald Del Seni; "One Teacher's Opinion", (about science fairs) by Gene P. Kingham; "How to Have a Better Science Fair", by H.G. Hodes, L.A. Popp, and F.G. Robinson; "The Planetarium as a Teaching Tool", by Ora Ann Schultz and Catharine Y. Bonney; "A Model For Initiating Accountability", by Robert J. Starr; "Working in Public Relations", by Robert Fariel; "The Continuing Education of the Supervisor", by J. Joel Berger; "Utilizing Community Resources for Teacher Education", by Edward P. Ortleb; "The Graduate Education of a Science Supervisor", by David Butts and David May; "Planning for Safety", by Franklin D. Kizer; "The Supervisor and Teachers in Liability", by D. Anita Buzardt and Roderic E. Righter; "Science Education Research", by J. David Lockard; "Educational Funding: Planning for Involvement", by Gary L. Awkerman; "Educational Journals for the Science Teacher", by William S. LaShier, Jr.; "Periodical Literature for Science Teachers and Their Students", by Mitchell E. Batoff; "Utilizing Community Resources", by Charlotte Purnell; and "Organizing a Science Material Center", by Gerald Garner.

Descriptors: Science Supervision, Science Teachers, Supervisory Training, State Supervisors, Supervisory Models

Accession Number: SC 070

Harms, Norris. Project Synthesis: An Interpretive Consolidation of Research Identifying Needs in Natural Science Education. Final Report. Boulder, CO: Colorado University, 1980.

Availability:

Order Number: ED 216 885

Colorado University
College of Education
Boulder, CO 80309

Abstract:

This report describes the rationale, methodology, findings, and recommendations of "Project Synthesis", a research study which synthesized and interpreted information found in six selected databases. Using a discrepancy model, five focus groups (biological sciences, physical sciences, inquiry, elementary school science, and science/technology and society) each determined desired (ideal) states, described actual states, and offered recommendations based on discrepancies between the actual and desired states in their particular area of science education. Chapter 1 contains an overview and summary of the project and five focus groups. Chapters 2-4 are focused on the desired biology program, actual biology programs, and discrepancies between the actual and desired biology programs, including information gaps, needed research, and recommendations including information gaps, needed research, and recommended solutions. The desired state of physical science programs, actual state of physical science programs, and status and needs of precollege physical science education are considered in Chapters 5-7. The desired state of inquiry, status of inquiry, and an analysis of and recommendations for the role of inquiry in science education are discussed in Chapters 8-10. The status and needs of science education in the elementary grades and the interaction of science/technology and society and its place in precollege science education are considered in Chapters 11 and 12 respectively. (ERIC Abstract)

Descriptors: Educational Needs, Elementary School Science, Inquiry, Science Curriculum, Scientific Literacy, Secondary School Science, Science and Society, Science Education Research

Accession Number: SC 024

Harms, Norris C.; and Yager, Robert E., eds. What Research Says to the Science Teacher, Volume 3. Washington, D.C.: National Science Teachers Association, 1981.

Availability:

Order Number: ED 205 367

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

Presented in this document are the results of Project Synthesis, a research study designed to synthesize and interpret information found in three National Science Foundation-funded status studies: a literature review, a national survey, and case studies of the status of pre-college science, mathematics, and social studies educational practices in U.S. schools; in reports from the National Assessment of Educational Progress science assessment efforts; and in an analysis of current science textbooks and of the current situation in K-12 science. The five focus groups (biological sciences, physical sciences, inquiry, elementary school science, science technology, and society) used a discrepancy model, setting forth a desired state, describing the actual state of affairs in science education, identifying discrepancies between desired and actual states, and making recommendations for future action. Analyses relate to four goal clusters for learning outcomes and their relevance for (1) the individual, (2) societal issues, (3) academic preparation, and (5) career choice. (ERIC abstract modified.)

Descriptors: Biological Sciences, Curriculum Development, Educational Research, Elementary School Science, Elementary-Secondary Education, Evaluation Methods, Inquiry, Inservice Teacher Education, Physical Sciences, Preservice Teacher Education, Science Curriculum, Science Instruction, Science Teachers, Scientific Enterprise, Scientific Literacy, Secondary School Science, Technology

Accession Number: SC 087

Helgeson, Stanley L., ed. National Association for Research in Science Teaching 50th Annual Meeting. Abstracts of Presented Papers. Columbus: OH: ERIC Center for Science, Mathematics, and Environmental Education, 1977.

Availability:

Order Number:

ERIC Center for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education (ERIC/SMEAC) collaborated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 50th annual NARST conference in Cincinnati, OH, March 22-24, 1977. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. The variety of papers presented is shown in the following topics: teacher education, instruction, research priorities, teacher preparation, Piaget's grouping model, curriculum, perceptions, and curriculum dissemination. A table of contents provides access to the abstracts with symposia and session titles.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 086

Helgeson, Stanley L., ed. National Association for Research in Science Teaching 49th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1976.

Availability: Order Number:

ERIC Information Analysis Center for Science,
Mathematics, and Environmental Education
The Ohio State University
1200 Chambers Road
Columbus, OH 43212

Abstract:

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education (ERIC/SMEAC) cooperated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 49th annual NARST conference in San Francisco, CA, April 23-25, 1976. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. Examples of topics are concept mapping, matching experiences to learner needs, evaluation, preservice and inservice teacher education, curriculum, conceptual models, and learning. Session and symposia headings lend access to the abstracts.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 085

Helgeson, Stanley L., ed. National Association for Research in Science Teaching 48th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Science, Mathematics, and Environmental Education Information Analysis Center, 1975.

Availability:

Order Number:

ERIC Science, Mathematics, and Environmental
Education Information Analysis Center
The Ohio State University
400 Lincoln Tower
Columbus, OH 43210

Abstract:

The ERIC Science, Mathematics, and Environmental Education (ERIC/SMEAC) Information Analysis Center worked with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 48th annual NARST conference in Los Angeles, California, March 17-19, 1975. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. The range of papers represented here is signified by the following topics: teacher education, self-paced instruction, curricular approaches, learning theory, classroom observation instruments, social issues in science courses, student assessment, and teacher behavior. A table of contents provides reference to the abstracts with general session and subject headings.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 084

Helgeson, Stanley L., ed. National Association for Research in Science Teaching 47th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1974.

Availability: Order Number:

ERIC Information Analysis Center for Science,
Mathematics, and Environmental Education
The Ohio State University
400 Lincoln Tower
Columbus, OH 43210

Abstract:

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education (ERIC/SMEAC) cooperated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 47th annual NARST conference in Chicago, Illinois, April 15-18, 1974. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. Contributions to this volume of abstracts include papers on such topics as: learning behaviors, teacher education, student characteristics, educational objectives, instructional procedures, Piaget's theory and science teaching, instrument and test construction, curriculum development learning theory and processes, and research in teacher education. A table of contents provides access to symposia grouping and session headings.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts

Accession Number: SC 177 J

Hendrix, John R.; and Others. "Individualized Instruction through Concept Assessment". American Biology Teacher 43, 5 (MAY 81): 246-253.

Availability:

Order Number: EJ 246 329

National Association for Biology Teachers
11250 Roger Bacon Drive
Reston, VA 22090

Abstract:

When students come together in a science class, an educational problem of different student preconceptions and science vocabularies emerges. Since singular instructional levels often do not meet varience in student need, the authors sought to assess students' initial level of understanding of terms and concepts for better instructional effectiveness. The Cognitive Biological Concept Assessment Instrument (CBCAI) was developed to assess such initial student level. In Bloom's Taxonomy of Educational Objectives (1956), cognitive domain was used as a standard measure of concept level. Groups chosen for testing were high school students, college students, and high school teachers. Results were mixed. In some cases, college students attained higher concept levels than teachers. The authors stress the necessity of respondents understanding of, and following instructions for, the completion of the assessment instrument.

Descriptors: Bloom's Taxonomy, Student Cognitive Level, Cognitive Functioning, Science Teachers, Biology, Science Curriculum, Research in Science Process, Assessment of Learning

Accession Number: SC 163

Hofman, Helenmarie H.; and Ricker, Kenneth S. Science Education and the Physically Handicapped Sourcebook. Washington, D.C.: National Science Teachers Association, 1979.

Availability:

Order Number: ED 176 980

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

This is a sourcebook of information whose purpose is the expansion of participation in scientific careers of physically handicapped individuals. The book is divided into ten sections and includes teacher preparation programs; mainstreaming concepts; and resources of appropriate agencies, organizations, and associations. Specific handicapping conditions and strategies for teaching are included separately in some chapters. Implications for the expansion of science programs beyond the school, and careers in science for a handicapped person are also discussed. The book is comprehensive in scope, and designed for implementation by persons not necessarily well grounded in the needs of the handicapped or with a background in scientific terminology. It is in many instances, a collection of articles and papers from expert opinion sources and consequently emcompasses differing perspectives of a "handicapping" condition and constraints.

Descriptors: Science Education, Mainstreaming, Science for the Handicapped, Curriculum, Career Planning

Accession Number: SC 127

Hofstein, Avi; and Giddings, Geoffrey. Trends in the Assessment of Laboratory Performance in High School Science Instruction (Technical Report No. 20). Iowa City, IA: Science Education Center, 1980.

Availability:

Order Number: ED 184 877

Science Education Center
The University of Iowa
Iowa City, IA 52242

Abstract:

Presented is a review of three methods for evaluating the effects of laboratory work in high school science instruction. The report focuses specifically on evaluating student performance, what aspects are to be evaluated, and how to evaluate. A table is given of some of the limitations and benefits of each of the assessment procedures. The authors list several recommendations for use of the different types of assessment. (ERIC Abstract)

Descriptors: Academic Achievement, Laboratory Experiments, Scientific Principles, Secondary School Science, Student Evaluation

Accession Number: SC 108

Hollon, R.; Anderson, C.W.; and Smith, E.L. A System for Observing and Analyzing Elementary School Science Teaching: A User's Manual (Research Series No. 90). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Order Number:

Abstract:

This user's manual describes a system for the observation and analysis of elementary school science classroom instruction. The system provides a detailed description of the management and content of science lessons, including both narrative and coded data. The system allows one to analyze classroom instruction by dividing each lesson into a sequence of separate activities or student tasks. Each task is characterized with respect to a number of features, including classroom organization, teacher and student activities, conceptual information content, and science process skills practiced. The system is designed to be used in conjunction with the Task Features Analysis System (Research Series No. 89), but it can also be used independently. (Author Abstract)

Descriptors: Classroom Observation, Science Teaching, Task Analysis, Science Processes, Science Knowledge

Accession Number: SC 072

Horton, Phillip B. The Role of Teacher Characteristics and Personality in Student Learning in Individualized Science Programs. Melbourne, FL: Florida Institute of Technology, 1981.

Availability:

Order Number: ED 211 381

Florida Institute of Technology
Melbourne, FL 32901

Abstract:

Seventeen selected research studies relating student learning with teacher characteristics and personality in grades 7-12 science classrooms are reviewed. Methodology, objectives, and major findings of the 1960 "Teacher Characteristics Study" and short summaries of nine additional studies are considered in the first section dealing with general studies on the topic. Seven studies reviewed in the second section focus on individualized science programs in general and the Intermediate Science Curriculum Study (ISCS) in particular. It is concluded that (1) very little is known for certain about the relationships between teacher characteristics and personality, and teacher effectiveness in the classroom; (2) since the literature indicates that teachers who have received special training in conducting indiviudualized science instruction will be more effective in facilitating student learning, science teacher training programs should include experiences with this instructional strategy; and (3) further research is needed to investigate relationships between teacher factors and student variables other than achievement. (Author/ERIC Abstract)

Descriptors: Individual Instruction, Science Teachers, Secondary School Science, Student Teacher Relationship, Teacher Characteristics, Teacher Effectiveness, Science Education Research

Accession Number: SC 017

Howe, Trevor G.; and Gerlovich, Jack A. Crisis in Physical Science Teaching in High School. National Study of the Estimated Supply and Demand of Secondary Science and Mathematics Teachers. Ames, IA: Iowa State University, and Des Moines, IA: Department of Public Instruction, 1981.

Availability:

Order Number:

State of Iowa
Department of Public Instruction
Grimes State Office Building
Des Moines, IA 50319

Abstract:

A study of Iowa's public schools to discover the problems of science teacher supply and demand was later broadened to a national survey. The Iowa study looked at the years 1970 through 1980, identifying demand as the 447 public school districts' yearly teacher vacancies and supply as the 27 teacher education programs' yearly certificated science teachers. Factors affecting supply and demand emerged as inflation, major changes in the economy (science teachers lured to higher paying business jobs), the 1973-1975 recession (lowering the number of teacher vacancies), national unemployment (attracting teachers back), lower birth rates, federal grants, and declining school enrollments. Mathematics and science teacher shortages ranked in the critical range. The national survey expanded to include a telephone and questionnaire survey of State Teachers Certification Divisions and looked at 1980-1981 only. While compilation procedures and costs served to limit survey possibilities, enough information was collected to affirm the Iowa findings; particularly, that shortages exist of teachers in physics, mathematics, chemistry, and earth sciences. General science and biology teachers are adequately represented. Further, better funded study is implicated to help in meeting shortages and improving career counseling. Extensive tables and references support the study.

Descriptors: Science Teachers, Mathematics, Physics, Physical Sciences, Faculty Mobility, Career Awareness, Teacher Supply and Demand, Teacher Shortage

Accession Number: SC 066

Howe, Trevor G.; and Gerlovich, Jack A. National Study of the Estimated Supply and Demand of Secondary Science and Mathematics Teachers. Technical Report No. 23. Iowa City, IA: Iowa University, 1981.

Availability:

Order Number: ED 200 443

Iowa University
Science Education Center
Iowa City, IA 52242

Abstract:

This report presents complete data which identify specific areas of supply/demand inconsistencies in the state of Iowa by science discipline of secondary science teachers. Summarized are data concerning the number of graduates from teacher education institutions in Iowa completing preparation for a teaching certificate for the years 1979-80, and the following data concerning Iowa public high school science teachers for 1973-74 and 1978-79: subject area taught, education, school district size, with undergraduate or graduate majors in their teaching area. Results are also presented of a national telephone survey conducted by personnel of the Iowa State University Education Placement Office and Iowa Department of Public Instruction for each state which assesses the availability of information concerning the supply and demand of secondary school mathematics and science teachers. (ERIC Abstract)

Descriptors: Employment Patterns, Employment Qualifications, Mathematics Teachers, National Surveys, Science Teachers, Teacher Supply and Demand

Accession Number: SC 034

Hurd, Paul DeHart. Educational Goals in Science for the 1970's. Stanford, CA: Stanford University, 1972.

Availability:

Order Number: ED 064 118

School of Education
Stanford University
Stanford, CA 94305

Abstract:

Social problems and goals are intimately linked to science and technological influences. The 1960's disenchantment with the status quo is a direct result of the need to understand the massive changes brought about by research and invention, and of the change in priorities for knowledge acquisition from an historical perspective to a future perspective. Students today need adaptability and problem-solving skills for this world of rapid change, and in order to counteract what irresponsible technology has wrought. Such iminent issues as ecological and environmental quality exemplify the need for science curricula to concentrate on the future, not just history or even the present. Science teaching goals should be problem-centered with a focus on the welfare of all people. The sciences should also be taught hand-in-hand with other disciplines to encourage knowledge integration and a plurality of problem-solving skills, and with a more holistic view of curriculum goals. (ERIC Abstract Modified)

Descriptors: Educational Objectives, Educational Philosophy, Educational Trends, Science Education, Speeches, Technological Advancement, Futures (of Society)

Accession Number: SC 247 MF

Ideas for Teaching Science in the Junior High School. Washington, D.C.: National Science Teachers Association, 1963.

Availability:

National Education Association
Publications Sales
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

Order Number: ED 021 747

Abstract:

Provided is a compilation of more than 75 articles which have been printed in "The Science Teacher" relative to teaching science in the junior high school. The two basic types of articles selected were (1) those that help science teachers think through their purposes, and (2) those that suggest appropriate methods and techniques for implementing their objectives. Part 1 relates points of view in discussing such topics as (1) teaching methods, (2) student evaluation, (3) grade placement concerning specific subjects and laboratory work, (4) trends and issues in junior high school science teaching, and (5) others. Part 2 provides articles on classroom instructional ideas. Included are (1) descriptions of units, (2) discussions on making equipment and materials, and (3) descriptions of activities, laboratory techniques, student activities, and science demonstrations. (ERIC Abstract)

Descriptors: Biological Sciences, Earth Science, Physical Sciences, Science Activities,

Accession Number: SC 039

Interim Report of the Advisory Council on Math/Science Teacher Supply and Demand. Trenton, NJ: New Jersey State Department of Education, 1983.

Availability:

Order Number:

New Jersey State Department of Education
Division of Research, Planning, and Evaluation
225 West State Street, CN 500
Trenton, NJ 08625

Abstract:

The Advisory Council on Mathematics and Science Teacher Supply and Demand studied current and probable future needs for K-12 mathematics and science instruction in New Jersey. Reviewing standardized test scores reflected a pattern of decline and 1982-83 winter public hearings revealed a diminished pool of teacher candidates. Discrepancy analyses and surveys of all New Jersey school districts and of Department of Education's 10-year projections of supply and demand of math and science teachers provided scenarios for assessment. Conclusions show (1) current teacher shortages affecting all districts, but concentrated primarily in lower socioeconomic level districts; (2) a projected statewide shortage over the next ten years; (3) substandard certification for many currently employed math/science teachers; and (4) highly qualified persons in the profession being attracted to industry and research. Short-term recommendations (summer 1983-summer 1984) suggest pilot summer institutes to upgrade skills of certified math and science teachers and of surplus non-math and science fields who have some aptitude and background in science/math. Incentive programs to attract graduating students into the profession must be developed (grant and loan forgiveness programs, special career education). Curriculum development, equipment sharing, consortial relationships, and information exchange must be encouraged. Appendices include supply and demand forecasts, the survey form, and achievement scores.

Descriptors: Science Instruction, Mathematics Instruction, Teacher Shortage, Teacher Recruitment, Socioeconomic Influences

Accession Number: SC 148 MF

Ipsen, D.C. Issues in Elementary School Science. Washington, D.C.: National Science Teachers Association, 1970.

Availability:

NEA Publications Sales
1201 16th Street, N.W.
Washington, D.C. 20036

Order Number: ED 037 363

Abstract:

The following issues are examined in this monograph: (a) Should the scientific concepts that are introduced be restricted to those that are needed in describing the scientific facts the child will meet in the program or may concepts be introduced for their own sake or for the sake of demonstrating concept-development methods? (b) Should concepts or facts that are presented to the child be those that meet immediate interests--or perhaps stimulate new ones--or should they look toward some future study of science? (c) Should the methods of science be demonstrated only in their application to scientific investigation, or will abstract demonstrations serve as well? (d) Should the elementary science program emphasize the study by the child of factual material and the observation of natural processes, or should it give the child limited experience in scientific experimentation and the development of scientific concepts and facts? (e) Should science become an important theme in skill-development programs such as reading, writing, and arithmetic? (f) Should the only aim of the elementary school science program be to develop the child's understanding of scientific objectives, activities, and accomplishments, or should it instead--or in addition--be to develop the child's working knowledge of scientific concepts and facts and his/her proficiency in scientific methods? (ERIC Abstract Modified)

Descriptors: Curriculum Development, Educational Objectives, Elementary School Science, Instruction, Science Education

Accession Number: SC 139 J

James, Robert K.; and Hall, Gene. "A Study of the Concerns of Science Teachers Regarding an Implementation of ISCS". Journal of Research in Science Teaching 18, 6 (NOV 81): 479-487.

Availability:

Order Number: EJ 255 496

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The federal government has responded to public interest in science education by supporting the development of science curricula, but a 1978 survey reports a low extent of actual use. A conceptual model which provides insight into the individual concerns that teachers adopting a new program might express was employed in a study of science teachers adopting ISCS. Recommendations for implementations, based on study findings are: Strategies for implementation should be correlated to concerns and should change as concerns shift; training in skills should be graduated and continuous; personal support is essential; and, furthermore, evaluation of effects should be delayed until early teacher concerns have been resolved. The concerns concept seems a promising tool for understanding critical problems of an adoption process. It can be useful in guiding the implementation of educational innovations by helping to alleviate trauma individuals face when confronted with such change. (Author Abstract)

Descriptors: Curriculum, Research, Classroom Practices, Implementation, Innovation

Accession Number: SC 009J

Jones, A.V. "SCISP". Education in Chemistry 15, 4 (JUL 78): 117, 119.

Availability:

Order Number: EJ 191 222

Article Copy Service--CIJE
UMI Article Reprint Department
300 North Zeeb Road
Ann Arbor, MI 48106

Abstract:

Schools Council Integrated Science Project (SCISP) is a British process approach to science teaching. Material is chosen to demonstrate scientists' habit of first observing, then classifying, through the use of numbers, measuring, space-time relationships, communicating, predicting, informing, defining operationally, formulating hypotheses, interpreting data, controlling variables, and experimenting. Each section of material chosen to demonstrate these processes has clearly set objectives which can be tested at the end of the section. Course organizers project that science must be seen as an integral whole in the minds of pupils and society generally; thus integrated into one whole are chemistry, physics, biology, earth sciences and geology, along with sociology and psychology to show the social implications of the sciences. Difficulties for teaching are teaching outside one's own specific discipline and laboratory accommodations. Yet SCISP attempts to strike a relationship between pupils and teachers in learning. Books are supplied for pupils and teachers, along with a useful technicians' guide and background readers. A table illustrates the content of SCISP.

Descriptors: Science Curriculum, Process Education, Science Instruction, Integrated Curriculum

Accession Number: SC 110

Joyce, B. Toward a Theory of Information Processing in Teaching (Research Series No. 76). East Lansing, MI: Institute for Research on Teaching, 1980.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

Drawing on a recent series of investigations into teacher information-processing while teaching, the author advances a set of propositions to guide inquiry into the relationship between thought and action in the classroom. These propositions represent a "pre-theory"--steps toward defining the nature of information processing during teaching and the factors which determine its characteristics. The author found that the activity flow in a classroom so controls the kinds of information teachers receive that they are unlikely to process information in such a way as to move into a major decision-making frame. Teachers usually work within a general framework and "fine tune" that system.

Descriptors: Information Processing, Teaching, Pre-Theory, Classroom Activity

Accession Number: SC 161

Kahl, Stuart R.; and Anderson, Ronald D. Science Meta-Analysis Project: User's Guide for the Machine-Readable Raw Data File. Boulder, CO: University of Colorado, 1983.

Availability:

Laboratory for Research in Science and
Mathematics Education
University of Colorado
Boulder, CO 80309

Order Number:

Abstract:

The meta-analysis constitutes a pooling of results of many related research studies in pre-college science education. The book has, as its purpose, a user's guide to seven files of raw research data. The contents include a general description of the data files and a bibliography of research studies pertinent to the content areas. Content areas included in data files are: Curriculum Programs, Instructional Systems, Teaching Strategies, Nature and Structure of Content, Teacher Education, Teacher Characteristics, and Student Characteristics. Data is from card decks. The document includes modified coding forms giving variables used and methods of coding. Study codes are also printed in the bibliography study to enable a user to match data from a specific study to its bibliographic reference.

Descriptors: Data Base, Science Education, Curriculum Programs, Instructional systems, Teaching Strategies, Nature and Structure of Content, Teacher Education, Teacher Characteristics, Student Characteristics

Accession Number: SC 134 J

Kilbourn, Brent. "Curriculum Materials, Teaching, and Potential Outcomes for Students: A Qualitative Analysis". Journal of Research in Science Teaching 19, 8 (NOV 82): 675-688.

Availability:

Order Number: EJ 270 268

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

This is a qualitative analysis of a teaching episode in biology and shows the interplay between substantive content issues and pedagogical issues relating to the teacher's intentions, performance, and potential outcomes for students. The concept "epistemological flatness" is developed as a way of characterizing salient aspects of the curriculum materials and teaching, as revealed in the analysis. The conclusion of the article reflects on the function of the qualitative analysis itself. This article is a qualitative analysis of an episode from a biology lesson of a beginning teacher. The data and analysis are intended to present a picture of the intricate relationships among teacher intentions, curriculum materials, teaching, and potential outcomes for students. The article is divided into four major parts. The first part presents relevant background. The second part is an analysis, in terms of intended outcomes, of the curriculum materials and the teaching episode. The third part develops the concept of "epistemological flatness" as a way of characterizing an important dimension of science teaching revealed by the analysis. The conclusion reflects on the status of the qualitative analysis itself. (Author Abstract)

Descriptors: Teacher Performance, Qualitative Research, Outcomes, Science Teaching

Accession Number: SC 172

Kittle, Robert E. Program of Studies for Science 7-12, Kanawha County Schools. Charleston, WV: Kanawha County Schools, 1979.

Availability:

Kanawha County Schools
200 Elizabeth Street
Charleston, WV 25311

Order Number:

Abstract:

The book provides a basic science instructional guide for grades 7-12 in the Kanawha County School system, West Virginia. Outlined are basic science course offerings for all schools in the county, approved elective course offerings, methods for evaluation of instructional programs, instructional guidelines, and state and local policies and regulations appropriate to the courses of study. Also outlined are inventory and pruchasing methods for materials, and outlines and performance objectives within the specific disciplines of Life Science, Earth Science, Physical Science, Biology, Chemistry, and Physics. For each such discipline, a general description is given of intended course level, course content and purpose, prerequisites and future career or educational goals for which it may be seen as background. Also included throughout the guide are operational definitions for methods, terms, and objectives to be used. The guide, written in outline form, uses non-technical language except where definitions are included, and is detailed and comprehensive in both scope and sequence.

Descriptors: Science Teachers, Science Instruction, Science Procedures, Guidelines for Curriculum in Science, Curriculum, Science Performance Objectives, Science Continuum, Science in Public Education

Accession Number: SC 041

Klein, Sarah E. Testimony to Committee on Labor and Human Resources of the United States Senate in Ragard to 1983 Authorization for the Science Education Component of the National Science Foundation. Washington, D.C.: National Science Teachers Association, 1982.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number: ED 215 908

Abstract:

This testimony, supported by data from several national surveys, was presented by the president of the National Science Teachers Association regarding the elimination of science education from the National Science Foundation (NSF). Issues and topics addressed include a statement of the crisis in science and mathematics education, focusing on the science and mathematics teacher shortage, the decline in numbers of individuals prepared to teach in these subjects, and the employment of unqualified science and mathematics teachers. Attention turned next to the quality of science and mathematics education, prior NSF support of science and engineering education, NSF curriculum development projects and their effectiveness, comparisons of U.S. and U.S.S.R. science and mathematics education, and critical problems at the pre-college level. Finally, NSF programs and the 1982 budget for science and engineering education are discussed, together with the Special Commission of Science/Engineering Education, a suggested NSF 1982 program to address teacher shortages and in-service programs, public support for science education (ranked ahead of national defense), and a suggestion that science education programs could be financed by holding the proposed total research budget to two percent rather than 8.7 percent. (ERIC abstract modified.)

Descriptors: Budgets, Educational Trends, Elementary/Secondary Education, Engineering Education, Federal Legislation, Federal Programs, Financial Support, Government Role, Higher Education, Mathematics Education, Public Support, Science Course Improvement Projects, Science Education, Science Programs, Science Teachers, Teacher Shortage, Teacher Supply and Demand

Accession Number: SC 008 J

Knight, David W.; and Bethune, Paul. "Science Words Students Should Know". Journal of Reading 15, 7 (APR 72): 504-506.

Availability:

Order Number: EJ 053 934

International Reading Association
800 Barksdale Road
P.O. Box 8139
Newark, DE 19711

Abstract:

This word list was developed to provide teachers with evidence of the recognition of selected science words by students in grades 7 through 12 in Florida's Broward County Schools. The 277 scientific terms presented here were identified from locally produced materials. They were tested on a significant sample of students; if they were meaningful to 75 percent of students in a given grade, they were included at that grade level. Teachers anywhere can adapt the list to their regional teaching conditions, they can estimate vocabulary teaching needs, and they can decide to omit words not understood to make materials more readable. The 277 words tested are presented.

Descriptors: Science Instruction, High School Students, Junior High School Students, Reading Comprehension, Basic Vocabulary, Sciences

Accession Number: SC 005

Kuhn, Thomas S. The Structure of Scientific Revolutions. Chicago, IL: The University of Chicago Press, 1970.

Availability:

The University of Chicago Press
5801 Ellis Avenue
Chicago, IL 60637

Order Number:

Abstract:

After considering complementary notions of normal science and scientific revolution, this book constructs a scientific structure that is heavily influenced by non-rational procedures, and in which truth is not used as the criterion of new scientific theories. Sections of the book deal with the following: the route to, and nature of normal science; normal science as puzzle-solving; the priority of paradigms; anomaly and the emergence of scientific discoveries; crisis and the response to crisis in the emergence of scientific theories; the textbook tradition of the nature and necessity of scientific revolutions; revolutions as changes of world view, the revolutionary competition between porponents of old normal-scientific traditions and the adherents of the new one; and development through revolutions as compatible with the unique character of scientific progress.

Descriptors: Conflict Resolution, Revolution, Sciences, Scientific Methodology, Scientific Principles, Scientific Research

Accession Number: SC 109

Landes, N.; Smith, E.L.; and Anderson, C. The Task Features Analysis System (Research Series No. 89). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Order Number:

Abstract:

The user's manual describes a system for the analysis of elementary school science Teacher's Guides and other program materials. The system, which can be used with either textbook-based or activity-based programs, produces a detailed step-by-step account of "what the classroom would be like if the teacher followed the recommendations in the Teacher's Guide literally". Each unit of activity is called a student task; student tasks are characterized with respect to a number of features, including suggested classroom organization, teacher and student activities, conceptual information content, and science process skills addressed. The system can be used in conjunction with the Instructional System for Observing and Analyzing Elementary School Science Teaching (Research Series No. 90) or it can be used independently. (Author Abstract)

Descriptors: Classroom Observation, Science Teaching, Task Analysis, Science Processes, Science Knowledge, Teachers' Guides

Accession Number: SC 129 P

Langley, P.; Neches, R.; Neves, D.; and Anzai, Y. A Domain-Independent Framework for Procedure Learning. Pittsburgh, PA: Carnegie-Mellon University, 1980.

Availability:

Department of Psychology
Carnegie-Mellon University
Pittsburgh, PA 15213

Order Number:

Abstract:

In this paper, we outline a general theory of procedural learning. We first review some recent work in the area, and draw some conclusions from these efforts. Next, we present the specifications for a production system language in which our theory will be stated. The notions of production strength and level of activation play important roles in our approach. After this, we suggest a small number of learning heuristics which seem applicable across domains, such as rules for reinforcement, discrimination, generalization, finding recurring relations, and combining rules. Finally, we present a detailed example of learning in the domain of simple addition. (Author Abstract)

Descriptors: Cognitive Psychology, Artificial Intelligence, Learning, Production Systems, Learning Heuristics, Procedural Knowledge, Induction

Accession Number: SC 082

Lawson, Anton E., ed. 1980 AETS Yearbook: The Psychology of Teaching for Thinking and Creativity. Tempe, AZ: Arizona State University, 1979.

Availability:

Order Number:

ERIC Clearinghouse for Science, Mathematics
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

These papers address a psychological perspective of the development of rational thought and creativity and how instruction can aid in this development. Piagetian, Ausubelian, Gagnesian, and Skinnerian points of view are treated alongside those of humanistic psychologists such as Carl Rogers. A piece by E. Paul Torrence presents his views in the field of research into creativity. A Neo-Piagetian view of intellectual development and its implications for rational power development is accompanied by discussion of work on memory development and models of information processing. Syntheses of ideas from a variety of psychological research areas are provided. Research on neutrophysiology and how the two brain hemispheres process information in very different ways is reviewed. Each of the 11 papers also addresses six central questions concerning the development of the intellect and the design of instruction from the perspective of their respective psychological theories. These six questions address a listing of 10 natural powers identified by the 1961 Educational Policies Commission as the essence of the ability to think. Each paper has a mandate to touch upon day-to-day activities for encouraging rational powers development.

Descriptors: Science Instruction, Cognitive Development, Psychological Studies, Psychoeducational Methods, Creativity Research, Creative Development, Science Activities

Accession Number: SC 193 J

Lazar, Alfred L. "Psycho-Educational Considerations When Planning Science Instruction for the Physically Disabled". Journal for Special Educators 17, 1 (Fall 80): 14-20.

Availability:

Order Number: EJ 248 525

Journal of Special Educators
Subscription Department
111 Fifth Avenue
New York, NY 10003

Abstract:

The author states the need for science educators to become familiar with definitions and recognition of handicaps as part of the educational mainstreaming philosophy. This familiarity would allow educators to provide appropriate science education to handicapped individuals within the goals and objectives of an IEP (Individual Educational Program). A plan is included for assisting the science teacher in making decisions regarding curriculum for the disabled person using the G-SOME model developed by Lazar (1971-1972). Included in that model are psycho-educational considerations, such as evaluation procedures, survey of needs of the disabled student, task analysis of educational goals, and objectives and methods of instruction. Science teachers are also encouraged to develop adjustment to disability through the perceptions of the disabled and his/her parents.

Descriptors: Science Education for the Handicapped, Individualized Education Programs, Science Teachers, Curriculum

Accession Number: SC 037

Lazarowitz, Reuven; and Others. Reasons Why Elementary and Secondary Students Do and Do Not Like Science. Provo, UT: Brigham Young University, 1981.

Availability:

Brigham Young University
Provo, UT 84062

Order Number: ED 214 797

Abstract:

Investigation of Utah elementary and secondary school students asked (1) why do students in Utah like science subjects; and (2) are there any differences in reasons why students like science subjects related to type of school, age of students, and student gender. Roughly 2,000 pupils participated in the study from grades 6 through 12. They were told to list up to five science subjects that interested them, and to choose from a list of 18 reasons why they liked a subject. Pupils were also asked to think of a science subject they did not like, and to give a reason. A total of 1,855 pupils indicated they liked at least one science subject, while 802 indicated a dislike for a course. The survey also showed 87 percent of those who liked at least one science subject area gave liking to go outdoors as the main reason. Of those who listed a dislike, the major reason given was related to a teacher as a person and his or her ways of teaching (33 percent). Analysis of data related to the second part of the study revealed differences in reasons related to school type, student age, and student gender. Rural and urban schools had a higher frequency of affective reasons related to students' pragmatic needs regarding Human Body and Anatomy, than did students in suburban schools. Human Body and Anatomy courses showed an increase in frequency of reasons related to students' needs correlated with grades. Boys and girls chose the same reasons for each science subject. The only difference found was the extent of the reasons chosen according to gender. References, tables, and survey instrument are provided. (ERIC Abstract Modified)

Descriptors: Educational Research, Elementary Education, Elementary School Science, Science Curriculum, Science Education, Science Instruction, Secondary Education, Secondary School Science, Student Attitudes

Accession Number: SC 194 J

Levin, Dan. "What to Do When Your Science and Math Teachers Abandon Their Classrooms". American School Board Journal 169, 9 (SEP 82): 21-24.

Availability:

Order Number: EJ 268 255

National School Boards Association
1055 Thomas Jefferson Street, N.W.
Washington, D.C. 20007

Abstract:

The article states the need for alarm concerning shortages of science and mathematics teachers. Industry is stated as being part of the reason for shortages, but of greater impact is the lack of financial support for science education. Offered in this article are methods for attracting more teachers in science and mathematics. Some of those methods include increase in funds for teacher training, teacher aids and incentives, research opportunities for gifted students, closer cooperation among scientists and school officials, exempting science and mathematics teachers from mundane school tasks, and creating part-time teaching positions for qualified individuals not currently in the work force. An overview of methods some states have taken to meet the current emergency is given. In many cases school systems are paying stipends for science coursework taken by teachers in exchange for teaching time. Retraining programs for school personnel are seen as one mechanism for allieviating the shortage.

Descriptors: Teacher Shortage, Federal Educational Funding, Science Teachers, Mathematics Teachers, National Science Foundation, Science Education

Accession Number: SC 131

Lindelow, John. The Emerging Science of Individualized Instruction. A Survey of Findings on Learning Styles, Brain Research, and Learning Time with Implications for Administrative Action. Eugene, OR: ERIC Clearinghouse on Educational Management, 1983.

Availability:

Order Number:

ERIC Clearinghouse on Educational Management
College of Education
University of Oregon
Eugene, OR 97403

Abstract:

This report is a part of a series--the School Management Digest--designed to offer educational leaders essential information on a wide range of critical concerns in education. At a time when decisions in education must be made on the basis of increasingly complex information, the Digest provides school administrators with concise, readable analyses of the most important trends in schools today. The goal of this analysis is improvement of educational practice. Each Digest points up the practical implications of major research findings so that its readers might better grasp and apply knowledge useful for the operation of the schools. (ERIC Abstract Modified)

Descriptors: Learning Styles, Brain Research, Learning Time, Information Digits, Administration

Accession Number: SC 117

Lindvall, C.M.; and Ibarra, C.G. The Development of Problem-Solving Capabilities in Kindergarten and First-Grade Children. Pittsburgh, PA: Learning Research and Development Center, 1979.

Availability:

Learning Research and Development Center
University of Pittsburgh
3939 O'Hara Street
Pittsburgh, PA 15260

Order Number:

Abstract:

This study investigated a theoretical structure which attempts to explain the problem-solving strategies used by first-grade students who are successful in solving simple arithmetic story problems. The structure used describes the problem-solving procedure as consisting of a three-stage model building process: (a) comprehending the story, (b) building a general conceptual model, and (c) generating a mathematical model. Results, based on a study of the performance of 81 students, appear to support the proposed theoretical structure in that essentially all students who can give the correct answer to a problem are able to develop a general model of the problem. (Author Abstract)

Descriptors: Problem Solving, Primary Education, Theoretical Structures, Research, Model-Building

Accession Number: SC 157 P

Lochhead, Jack. Beyond Emile: Misconceptions for Education in the Twenty-First Century. Amherst, MA: University of Massachusetts, 1983.

Availability:

University of Massachusetts
Amherst, MA 01003

Order Number:

Abstract:

This paper explores the teaching possibilities for several methods of learning, all of which use a group model for providing a more active format for student learning. The rationale presented for group interaction is based on the perceived inadequacy of currently used lecture methods. The author suggests that better comprehension requires discussion and reflection of subject matter. Since this is not usually possible between one teacher and many students, group skills of processing information should be taught for eventual effectiveness in the learning of science concepts. Pair problem solving, because of its vocabulization and reflective listening as an accuracy check, is suggested. Also described are laboratory discussions of student work and student observation of one another's work. In these structured group learning situations, the teacher's role is described as facilitating the development of process skills needed for constructing accurate information models.

Descriptors: Science Curriculum, Science Education, Science Teachers, Group Dynamics, Role-Playing, Curriculum

Accession Number: SC 038

Louwerse, Frances H. A Composite Self-Report: Reasons for Taking Science Courses as Given by Cocoa High School Science Students. Cocoa, FL: Cocoa High School, 1981.

Availability:

Order Number: ED 215 882

Cocoa Beach High School
Cocoa, FL 32922

Abstract:

A self-report instrument (questionnaire/reaction scale) was developed and administered to students in grades 9-12 to determine the number of science courses taken by each grade level, to estimate the number of science courses requested for future years, and to indicate where recruitment efforts would be needed. The instrument also examined other-direct reasons for taking science (external locus of control), student understanding of the role of science education, student career aspirations, effects of science classroom atmosphere, and science and nonscience teachers' classroom methodology. Further, it provided students with the opportunity to express their views about science classes. Data were organized by sex (N = 790, 406 males and 384 females) and grade level as percentages of responses to individual items, and were arranged by such categories as other-directed reasons for taking science and student career aspirations. Data suggests students take science because of their like of science and hands-on activities, parental influence, the fact that both sexes were encouraged by science teachers, understanding the role of science in total education, and their positive views of science teachers. Students did not appear to take science because of such other-directed reasons as counselor influence, effect of science on society, a desire to become scientists or comparing science teachers to other teachers or courses. The research instrument is provided within the text. (ERIC/Author Abstract Modified)

Descriptors: Career Awareness, Classroom Environment, High School Students, Science Curriculum, Science Education, Science Interests, Science Teachers, Secondary Education, Secondary School Science, Sex Differences, Student Attitudes, Student Reaction

Accession Number: SC 033

Lunetta, Vincent N. Issues in Physics Education in Historical and Contemporary Perspective. Technical Report #24. Iowa City, IA: University of Iowa, 1982.

Availability:

Order Number: ED 216 857

Science Education Center
University of Iowa
Iowa City, IA 52242

Abstract:

Trends in physics curricula and instruction are reviewed, with emphasis on changes created by the recent growth in information, changing perceptions of the nature of the physics discipline, and the advent of a physics classroom that includes both physics career-bound students and students who simply need a general understanding in order to survive in a technological age. The state of physics in the 1950's is chronicled, followed by documentation of the revolution in curricular projects begun at that time, such as the Physical Science Study Committee Physics course, the Nuffield Physics Project, Project Physics (formerly Harvard Project Physics), Berkley Physics Course, Intermediate Science Curriculum Study, and Man Made World. Further discussion centers on trends in student grouping and pacing, relevance through applied science and societal issues, the role of the laboratory, use of resource materials and media, role of the teacher, and the influence of research on learning and development in the curriculum development process. (ERIC Abstract Modified)

Descriptors: College Science, Curriculum Development, Educational Trends, Elementary School Science, Elementary Secondary Education, Higher Education, Physics, Science Course Improvement Projects, Science Curriculum, Science Education History, Science Instruction, Secondary Education, Secondary School Science

Accession Number: SC 050

Marchand, Susan G., ed. Strategies for Equality: Mathematics/Science, Volume IV. New Brunswick, NJ: Training Institute for Sex Desegregation of the Public Schools, 1980.

Availability:

Order Number: ED 195 608

Training Institute for Sex Desegregation
Rutgers University, Federation Hall
Douglass Campus
New Brunswick, NJ 08903

Abstract:

This book evolved from projects that participants in a training institute for sex desegregation developed to eliminate sex bias in their classrooms and school districts. The first chapter of the book delineates recent research in sex bias related to achievement in mathematics and science. The following five chapters present projects on the following themes: (1) evaluation for sex bias in school mathematics and science programs, (2) communication with and education of parents and staff, (3) the use of word problems and of a unit or spatial relationships, (4) career awareness for males and females, and (5) the use of both female and male role models in project data collection instruments, relevant documents, and instructional materials. (Author/ERIC Abstract)

Descriptors: Mathematics Education, Science Education, Sex Bias, Sex Fairness

Accession Number: SC 104

Martin, J.M. Approaches to Research on Teaching: Implications for Curricular Theory and Practice (Occasional Paper No. 60). East Lansing, MI: Institute for Research on Teaching, 1983.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

Many researchers note that methods in research on teaching have been atheoretical, that researchers have worked in isolation from each other, and that findings have had limited application to practice. This review and theoretical proposal assumes that curriculum is concerned with method and with content and that the two are interrelated and interdependent in practice; thus, research on teaching is related to curriculum in use and can inform curricular theory. This exposition presents an overview of different types of research on teaching, then introduces a model for relating the types of research on teaching to three different theoretical perspectives (reproductive, constructive, and reconstructive) and to curriculum in use. (Author Abstract)

Descriptors: Research Methods, Improving Instruction, Synthesis, Research Problems, Theory/Practice

Accession Number: SC 029 J

Matthews, G.P. "An Example of the Teacher Expectation Effect in Mixed Ability Teaching". Journal of Research in Science Teaching 19, 6 (SEP 82): 497-502.

Availability:

Order Number: EJ 267 533

Wiley-Interscience
Division of John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

Teacher expectations or "self-fulfilling prophecy" effects were tested in 12 United Kingdom mixed ability classes of students age 13, where chemistry was being taught in an extremely uniform way. The poor behavior of one of the groups led to its being stigmatized by the staff as having poor ability, and for various doubtful reasons, this became associated with another class as well. Meanwhile, two other classes emerged as being more than usually enthusiastic about learning. One instructor nearly developed an examination that would be easier for the disliked classes, in a hopeful effort to raise their marks (hence their morale), change their attitude, and perhaps increase their abilities. However, an identical examination for all was decided upon. A statistical analysis of examination marks showed that none of the above reputations were justified in academic achievement. Such findings demonstrated the ease with which academic achievements can be hampered unwittingly by the prejudices of a teacher even in a well-structured learning situation. Figures accompany the text. (Author Abstract Modified)

Descriptors: Chemistry, Science Instruction, Expectation, Performance, Failure, Labeling (of Persons), Science Teachers, Student Teacher Relationship

Accession Number: SC 168

McDermott, Lillian C.; Rosenquist, Mark L.; Popp, Brian D.; and zan Zee, Emily H. Identifying and Overcoming Student Conceptual Difficulties in Physics: Student Difficulties in Connecting Graphs, Concepts, and Physical Phenomena. Seattle, WA: University of Washington, 1983.

Availability:

Department of Phyics
University of Washington
Seattle, WA 98195

Order Number:

Abstract:

This is a report on the findings associated with descriptive studies in the identification of student problems in application of mathematics to physics. Two major problems are described. The first is the difficulty students find in relating aspects of a graph to scientific concepts. The second problem is that of connecting scientific concepts and accompanying graphs to the physical aspects of the concrete world. The authors state that graphs, concepts, and physical phenomena are separate concepts that can not necessarily be related without explicit instruction. Examples are provided in the text of areas of student difficulty. Also provided are curriculum suggestions for providing skills and cognitive reasoning needed for success. Emphasized are the requirements of comprehensive graphing skills needed for relating science concepts. The authors suggest use of laboratory observation and manipulation of physical systems in the instructional process.

Descriptors: Physics Curriculum, Curriculum, Science Teachers, Physics Teachers, Laboratories, Cognitive Development, Student Misconceptions

Accession Number: SC 007 J

McEachron, Donald L. "Teaching Theories: The Evolution-Creation Controversy". American Biology Teacher 44, 7 (OCT 82): 413-420.

Availability:

Order Number: EJ 268 921

National Association for Biology Teachers
11250 Roger Bacon Drive
Reston, VA 22090

Abstract:

Creationism and evolutionism can be complimentary if the former is maintained as a religious belief or explanation and the latter remains a scientific theory. A scientific theory is a testable and correctable explanation of observable phenomena that yields new information about nature in answer to a set of pre-existing problems. Scientific theories can never be proven absolutely--they are an unending search for the truth. Evolutionism depends upon observation, testing and control of phenomena that holds true to the theory. Creationism, a religious explanation, rests rather upon faith in the existence of an untestable, unobservable, uncontrollable God. Evolutionism is open to further developments as scientists gain new knowledge. Creationism holds that nothing more needs to be known. In the schools, evolutionism should be taught as the best available scientific explanation of nature. Creationism should not be taught as science, but could be taught in its proper historical and philosophical context with the difference between scientific and religious explanations of events highlighted. Science and religion need not be at war, as they can be seen as two subsets or perspectives on the same reality. References are included.

Descriptors: Evolution, Biblical Literature, Religious Conflict, Scientific Methodology, Scientific Concepts, Science Instruction

Accession Number: SC 181 B

McFadden, Charles P., ed. World Trends in Science Education. Halifax, Nova Scotia, CA: Atlantic Institute of Education, 1980.

Availability:

Order Number: ED 199 070

Atlantic Institute of Education
5244 South Street
Halifax, Nova Scotia, Canada B3J 1A4

Abstract:

Nearly 100 science educators from 26 countries gathered in Halifax, Nova Scotia, Canada in August 1979 to take part in a symposium on world trends in science education sponsored by the Atlantic Institute of Education. The theme of world trends in science education permitted a broad spectrum of ideas and experiences to be exchanged. The exchange included input from educators from socialist, capitalist, and developing countries. This book represents a generous selection of the proceedings. It is divided into six major segments: Part I deals with perspectives in educational trends and issues, Part II presents science curriculum issues for the future, while Part III deals with curriculum development activity around the world. Part IV focuses on teacher education for the future, Part V contains some approaches to research in science education, and Part VI speaks to greater cooperation in science education. (Author Abstract Modified)

Descriptors: Curriculum, Science, Science Teachers, International Science Issues, Research in Science, Educating Teachers, World Science, Internation Patterns, Regional Science Needs

Accession Number: SC 061

Mechling, Ken. Survey Results: Preservice Preparation of Teachers of Science at the Elementary, Middle, and Junior High School Levels. Washington, D.C.: National Science Teachers Association, 1982.

Availability:

Order Number: ED 214 804

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

In preparation for developing a position statement for the National Science Teachers Association (NSTA) on the preparation and certification of elementary and middle/junior high school science teachers, several NSTA committees conducted a survey of 50 colleges and universities with teacher education programs. Results of the survey (N=45) are presented, question by question, along with some explanations. Selected findings indicate that: (1) 44 of the colleges require students in elementary teacher education to complete science courses (a median of 8 semester hours for all colleges), although only 8 require courses in all three science areas (biological, physical, and earth sciences); (2) 42 require courses in elementary science teaching methods, many emphasizing science process, methods, and teaching techniques more than content; (3) for middle schools teacher education, 29% of the responding colleges have programs specifically for this level with an average of 30 semester hours of science required, only two requiring a specific science methods course for this level; (4) one-third of the colleges offer science education programs specifically for junior high level and more than half of those without a specific program include it as part of the secondary science teacher preparation program. (ERIC Abstract)

Descriptors: Elementary School Science, Methods Courses, National Surveys, Preservice Teacher Education, Secondary School Science, Teacher Education Programs

Accession Number: SC 028 J

Mechling, Kenneth R.; Stedman, Carlton H.; and Donnellan, Kathleen M. "Preparing and Certifying Science Teachers: An NSTA Report". Science and Children 20, 2 (OCT 82): 9-14.

Availability:

Order Number: EJ 268 943

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

National Science Teachers Association (NSTA) committees on preschool, elementary school, middle/junior high school, and research collaborated in conducting three surveys to develop a database on science teacher education and certification with a goal of later proposing standards for science teacher preparation. A survey of preservice preparation at 50 top colleges/universities pointed to a marked need for more science content courses, with specific courses in biological, physical and Earth science, in science teaching methodology, and in age-group appropriate science methodology courses (especially for middle/junior high school children). The survey of teacher certification practices nationwide showed extreme variances from state to state. Most middle and junior high school teachers hold either elementary or secondary education certification, with the latter having had anywhere from 24 to 50 semester hours in science. Few states anticipate increased requirements (only 12 report recent legislation for the same). The final survey, of elementary teachers' assessment of their preparation, saw these teachers feeling significantly inadequately prepared, although most highly enjoyed the few teaching college science courses offered or required. Recommendations propose more tailored science methods and contents courses, geared to specific grade levels, and more hours of the required (particularly for elementary and middle school teachers). Several figures illustrate survey results, and references are provided.

Descriptors: Preservice Teacher Education, Science Instruction, Scientific Concepts, State Standards, Teacher Certification, Elementary School Science, Elementary School Teachers, Secondary School Teachers, Middle Schools, Junior High Schools

Accession Number: SC 031

Meyer, Agnes E. Education for a New Morality. New York, NY: MacMillan Company, 1957.

Availability:

MacMillan Publishing Company
866 3rd Avenue
New York, NY 10022

Order Number:

Abstract:

The cleavage between natural and cultural sciences in educational systems has grown at about the same rate as U.S. primarily rural and more sectarian society has changed into an increasingly urban, industrial, and technological society. Democratic society increasingly demands that scientists and lay people understand each other, so that they can keep up with historical developments and move society ahead harmoniously. Scientists must recognize the widest human implications of their contributions in order to protect society from the injurious uses to which science may be put; at the same time the average layperson must be educated to scientific methodology as not just dry materialism, but also a way of living that involves learning by doing. While science is not a dogma to be worshipped, it has proven itself to be one of the most effective ways of arranging material for the encouragement of thought. Such methodology should be taught alongside the arts and humanities so that ability can be measured not so much by a child's verbal level, but rather by his or her readiness to face problems and to solve them, a more realistic way of raising children in an evermore complex society fraught with rapid change, and ever more continuous but highly diverse world views, beliefs, and lifestyles. Culture itself springs from the complementarity of many opposites: free will and determinism, the spontaneous and the responsible, the particular and the universal, the individual and the environment, and science and the humanities. Scientists and humanists must unite in education to move away from mass society depersonalization to individualism, mutual responsibility, universal brotherhood, and even a new God-concept that will speak to all people as members of an infinite whole.

Descriptors: Moral Values, Social Values, Codes of Ethics, Science Education, Scientific Attitudes, Humanism, Humanities, Communism, Democracy, World Affairs, World Problems, Global Approach, Scientific Methodology, Learning Processes, Interdisciplinary Approach

Accession Number: SC 135 P

Neches, R.; and Hayes, J.R. Progress Toward a Taxonomy of Strategy Transformations. Pittsburgh, PA: Carnegie-Mellon University, 1981.

Availability:

Department of Psychology
Carnegie-Mellon University
Pittsburgh, PA 15213

Order Number:

Abstract:

A theory of how people modify their problem-solving strategies through experience would have a number of instructional implications. Such a theory would allow us to design easily learned novice strategies with minimal effort. Further, it would enable us to promote the transformation process by explicitly teaching students techniques for improving their strategies. The first step towards a theory of strategy transformations is to determine what sort of transformations are possible, i.e., to develop a taxonomy of strategy transformations. In this paper, we report progress in defining such a taxonomy. Eight types of strategy transformations are described, with their implications demonstrated by examples from a variety of experimental and everyday tasks. Some processes possibly underlying each of the transformation types are suggested. The typology of transformations is compared to some taxonomies of cognitive development, finding a number of common features. Finally, we suggest several higher order dimensions along which strategy transformation types might be categorized. (Author Abstract)

Descriptors: Theory Building, Problem Solving, Information Processing, Transformations, Taxonomics

Accession Number: SC 188 J

Neuman, Donald B. "Elementary Science for All Children: An Impossible Dream or a Reachable Goal"? Science and Children 18, 6 (MAR 81): 4-7.

Availability:

Order Number: EJ 243 005

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

Suggested here are methods by which science can become a realistic educational goal for elementary education. The author makes a strong suggestion that the primary method for future science competence at the elementary school level is through an elementary science teacher specialist. He outlines methods by which support for this approach to science can be done. Included as goals are the establishment of administrative commitment and faculty support of such specialized instruction; identification of potential; interested inschool teachers; selection of an experiential science program; indepth teacher education of those specialists selected; creation of a school science center; student assistants; and establishment of follow-up format for the embedding of acquired skills into other curriculum programs. He offers many suggestions for the reflection of science concepts to math, reading, writing, and spelling.

Descriptors: Elementary Science, Science Teachers, Science Programs, Science Centers Curriculum, Elementary Education

Accession Number: SC 142

Novak, Joseph D. A Summary of Research in Science Education--1972. Ithaca, NY: Cornell University, 1973.

Availability:

Order Number: ED 090 055

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education
400 Lincoln Tower
1800 Cannon Drive
Columbus, OH 43210

Abstract:

Of the over 400 studies in science education reported in 1972, 231 are summarized for this research review. A significant professional bias effects the selection of studies for their contribution to understanding of teaching and learning processes and/or research methodology in science education. Many findings, including most of the 24 Piagetian studies, are related to Ausubel's theory. Studies dealing with student achievement are found to be unrelated to a theoretical framework and to not address how specific concepts in cognitive structure influence subsequent learning or the effect of instruction on qualitative differentiation of cognitive structure. Review of studies dealing with instructional issues finds a substantial focus on individualized instructional modes. Evaluation in science education is found to suffer from inadequacies, especially in measuring affective variables. Curriculum studies are criticized for not becoming radically more effective. Interaction analysis studies are reported with the suggestion that they would be more valuably framed in terms of learning variables rather than in interaction patterns. Problem solving ability or inquiry ability studies are criticized for measurement difficulties. Studies on teacher training programs are thought to offer hope in modifying teacher behavior. A miscellaneous category touches on several other science education issues. A bibliography outlines the 430 studies considered for this report.

Descriptors: Science Education, Educational Research, State of the Art Reviews, Scientific Research, Teaching Methods, Psychoeducational Methods, Curriculum Evaluation, Science Curriculum, Teacher Education, Learning Theories

Accession Number: SC 083

Ochs, Daniel V., ed. 1981 AETS Yearbook: Improving Practices in Middle School Science. Louisville, KY: University of Louisville, 1981.

Availability: Order Number:

ERIC Clearinghouse for Science, Mathematics
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

This Association for the Education of Teachers in Science (AETS) Yearbook contains articles about middle school science that are built on the Tyler Instructional objectives approach to curriculum and school practices development. Theoretical and practical curriculum and instructional models are proposed in an overview of the middle school model. Characteristics of contemporary life that should be considered in developing a science curriculum are identified. Learner objectives that should be included in a basic middle school philosophical perspective are described to include the onset of puberty, development of self-concept, and development of intellect. Objectives that could lead to scientific literacy and a spectrum of sources are discussed. Presentation of practical illustrations and specific activities of well-established curriculum programs includes examples that integrate science and other subject areas. A particular curriculum program is outlined, and teaching strategies developed in the Memphis State University teacher preparation program are discussed. Three teacher training models that incorporate field experiences are described (these include Memphis State University, Georgia Plan, and Iowa UPSTEP). In-service programs are treated with specific references to large metropolitan districts and geographically disparate smaller systems. Finally, teachers and administrators reflect on the statements found in the previous chapters.

Descriptors: Middle Schools, Junior High Schools, Secondary School Science, Instructional Development, Curriculum Development, Instructional Innovation, Teaching Methods, Science Teachers, Sciences, Inservice Teacher Education

Accession Number: SC 122 P

Orpwood, Graham W. F.: Souque, Jean-Pascal; and Ferguson, Janet. Deliberative Inquiry: The Study of Policy and Practice in Canadian Science Education. Ottawa, Canada: Science Council of Canada, 1983.

Availability:

Science Council of Canada
Ottawa, Canada

Order Number:

Abstract:

This symposium is concerned with curriculum deliberation, with curriculum research, and with a large scale study of science education in Canada, which has sought to integrate the two. The interactive model used in this study is called "deliberative inquiry" and, in what follows, some experiences and reflections from three years work with it are described. In the first paper, the model itself is outlined and the deliberative component is described in more detail. The second paper provides a description of the research component with an account of the goals, procedures, and some results of the research program. Finally, in the third paper, the model is illustrated by describing how a particular theme--the science education of women--has been studied. (Author Abstract Modified)

Descriptors: Curriculum, Research, Science Education, Deliberative Inquiry, Women

Accession Number: SC 067 P

Padilla, Michael J. The Relationship Among Formal Operational Abilities, Selected Achievement Variables and Student Teacher Success. Athens, GA: University of Georgia, 1981.

Availability:

University of Georgia
Athens, GA 30602

Order Number:

Abstract:

Results are reported of an investigation of the relationship between preservice teachers' cognitive developmental level and their ability to teach effectively during student teaching. Other variables, including teacher locus of control, SAT verbal and math scores, and teaching effectiveness, were also examined. Elementary (N=22), middle school (N=31), and high school (N=24) preservice teachers were individually tested with four Piagetian student teaching abilities assessed using the Teacher Performance Assessment Instruments (TPAI). Included among the results was the lack of a significant relationship between any of the broad teaching performance categories and teacher cognitive development. Percentages are also reported and discussed for cognitive developmental levels of the elementary, middle school, and high school preservice teachers. (ERIC Abstract)

Descriptors: Cognitive Development, Locus of Control, Science Teachers, Student Teachers, Teacher Characteristics, Teacher Effectiveness, Science Education Research

Accession Number: SC 045

Padilla, Michael J. Science and the Early Adolescent. Washington, D.C.: National Science Teachers Association, 1983.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

Selections from journals, bulletins, and individual essays relate to middle or junior high school science instruction as a unique discipline for early adolescents, distinctly separate from elementary and secondary science. Introductory pieces give a philosophical backdrop to teaching science at this level, asking in what respect is junior high school "junior", and looking at changing perspectives in the field. The unique developmental characteristics of the early adolescent are then treated in articles which emphasize the cognitive, social, and emotional aspects of this development. Selections on the methodology of teaching science concentrate on the difficulties of teaching 10- to 15-year-olds, organizing the laboratory, assessing a science program, and incorporating the ever-emerging creativity of this age group into class projects. The collection concludes with a wide variety of activities and unit ideas from the life and physical sciences, many stressing scientific thinking or science process skills. Activities include: using consumer science to develop experimental techniques, focusing on the senses, a classroom planetarium, graphing, archeology in the classroom, and calculating energy consumption.

Descriptors: Middle Schools, Junior High Schools, Adolescents, Adolescent Development, Science Instruction, Science Activities

Accession Number: SC 096 J

Peterson, Kenneth; and Mayes, Bea. "Ideal Teacher Behavior Perceptions of Science Students: Success, Gender, Course". School Science and Mathematics, 81, 4 (APR 81): 315-321.

Availability:

Indiana University of Pennsylvania
P.O. Box 1614
Indiana, PA 15701

Order Number:

Abstract:

Rankings by high school science students of descriptions of ideal teacher behavior were investigated with the Peterson-Yaakobi Q-Sort. Twenty-four item rankings were tested according to student success in science, student gender, and the science subject under study. High achievers gave importance to items reflecting concern for subject matter and positive response from the teacher of the students' work, opinions, and ideas. Low achievers supported statements of teacher behavior that have such negative connotations as the teachers' being disorganized, using words students do not understand and using punishment to maintain control. Differences in item rankings by gender could be said to follow stereotypic gender role expectations (males focusing on nonpersonal subject matter, females on personal and social items). Ideal teachers as perceived by students in general science, biology, and physics classses differed according to the degree of selectivity of the classes, differences in teaching emphases, subject content and structure, and to differences in the students themselves. Biology students in particular rated highly teachers who follow school rules and procedures, require memorizing for tests, and use words students cannot understand. Physics students preferred a teacher who could get the subject matter across and create a comfortable learning atmosphere.

Descriptors: Science Teachers, Student Attitudes, High School Students, Teacher Effectiveness, Teacher Influence, Science Instruction, Sciences

Accession Number: SC 126

Phillips, Darrell G. Research Related to the Work of Jean Piaget: A Critique (Technical Report No. 3). Iowa City, IA: Science Education Center, 1974.

Availability:

Order Number: ED 098 082

Science Education Center
The University of Iowa
Iowa City, IA 52242

Abstract:

This publication consists of a critique of research related to the work of Piaget. Contents are arranged under five headings: Introduction, Common Misconceptions and Misuses, Common Research Errors: Possible Changes and Cures, Evaluation of Piaget-related Research, and Extention. Eighteen references conclude the report. (ERIC Abstract)

Descriptors: Cognitive Development, Educational Research, Research Reviews, Science Education, Piaget (Jean)

Accession Number: SC 115

Piper, Martha K.; and Moore, Kenneth D., eds. Attitudes Toward Science: Investigations. Columbus, OH: SMEAC Information Reference Center, 1977.

Availability:

Order Number: ED 167 388

SMEAC Information Reference Center
The Ohio State University
1200 Chambers Road, 3rd Floor
Columbus, OH 43212

Abstract:

Reported are 12 studies related to attitudes toward science. Seven of these studies involve preservice elementary teachers. The other five studies relate to attitude development of inservice elementary school teachers. Some additional studies on attitudes are in the summary and conclusions chapter of the document.

Descriptors: Attitudes, Elementary School Teachers, Inservice Teacher Education, Methods Courses, Preservice Education, Teacher Attitudes

Accession Number: SC 040 P

Ponzio, Richard. Science Education for the Eighties: Minority Participation. Oakland, CA: Mills College, 1981.

Availability:

Order Number: ED 201 534

Mills College
MaCarthur & Sem Avenues
Oakland, CA 94613

Abstract:

A review of recent research suggests that lack of role models, poor or even racist counseling, lack of parental encouragement, and bad teacher attitudes have limited involvement in the sciences by Blacks, Hispanics, and Native Americans. On the brigher side, preparation of minority students has improved with more affirmative action efforts by science-related industry (e.g., The Engineers' Council for Professional Development's Minority Introduction to Engineering--MITE, The Education Task Force of the Hewlett-Packard Corporation, the Fermi National Acceleration Laboratory, and the Mathematics Engineering, Science Achievement--MESA--programs). Legislators have also started to tackle the problem in Washington, D.C. and in California. Still to be seen however, for minorities to truly participate in the sciences are more minority role models, better teacher attitudes that do not limit miniorities and counseling that offers positive overall career incentives. (ERIC/Author Abstract Modified)

Descriptors: College Science, Higher Education, Minority Groups, Role Models, Science Careers, Science Education, Science Instruction, Science Programs, Secondary Education, Secondary School Science, Student Attitudes, Teacher Attitudes

Accession Number: SC 156 J

Posner, George J.; Strike, Kenneth A.; Hewson, Peter W.; and Gertzog, William B. "Accommodation of a Scientific Conception: Toward a Theory of Conceptual Change". Science Education 66, 2 (1982): 211-227.

Availability:

Department of Education
Cornell University
Ithaca, NY 14853

Order Number:

Abstract:

The authors discuss a theory of accommodation as a response to the replacement of one cognitive concept by another, and as an explanation for the conceptual framework of an individual for the selection of new concepts. His premise assumes that an individual's central concepts are vehicles by which new concepts become intelligible. Conditions for learning require that existing conceptions be unsatisfactory, that potentially new concepts appear plausible, and that new concepts have the potential to open new areas of inquiry. Some of the author recommendations for teacher strategies suggest the deliberate production of cognitive conflict as preparation for new concept formation, the expense of larger portions of teacher time in diagnoses of error in student thinking, and the presentation of science content within multiple modes of learning. Description of the teacher role is that of an adversary in "the sense of a Socractic tutor", and as a model of a scientific-like thinker.

Descriptors: Cognitive Functions, Science Education, Curriculum, Concept-Constructs, Learning Models, Science Instruction, Science Teachers

Accession Number: SC 186 J

Pottenger, Frances M. "The Pacific Experience and Science Education". The Education Digest XLIX, 1 (SEP 83): 54-57.

Availability:

Order Number:

Prakken Publications Inc.
416 Longshore Drive
Box 8623
Ann Arbor, MI 48107

Abstract:

This article's focus is on teacher education. The author speaks from science education programs based in Hawaii and cites three curriculum problems apparent there: (1) curriculum that is changed frequently, (2) science programs that are not adequately articulated within other programs, and (3) program changes without adequate teacher training or follow-up inservice. He offers five suggestions for improvement: (1) additional curriculum time for science, (2) more modern science content in materials, (3) greater use of inquiry learning, (4) more effective teacher training, and (5) greater teacher involvement in the development of science programs. The author suggests that the experience offered by the science programs outlined in the article is particularly informative for educators planning for the future. Such programs constitute science teaching in a young American educational system whose science literacy, however, seems typical for many older systems in the United States.

Descriptors: Teacher Education, Science Education, Science Curriculum, Science Programs, Education in Hawaii

Accession Number: SC 170

Prins, Rudolph; Crafton, Arvin; Henderson, Stephen A.; and Ochs, Dan. Needs Assessment Survey of Kentucky Science Teachers, Grades 7-12. Frankfort, KY: Kentucky Department of Education, n.d.

Availability:

Order Number:

Kentucky Department of Education
Division of Program Development
1829 Capital Plaza Tower
Frankfort, KY 40601

Abstract:

The paper was written to respond to questions regarding pre-college science teaching and science teachers in the state of Kentucky. It reflects the survey results of a questionnaire, modeled after one used in a 1978 National Science Survey. The Questionnaire was sent to all science teachers of grades 7-12. Types of questions included those regarding teacher educational background, school setting (rural, urban, etc.) and assignments (grades), specific area of expertise, current educational activities, professional organization participation, areas of perceived instructional need, resource needs, and factors perceived to affect the teaching of science. Results are summarized in major categories and data are expressed as relative frequency (percentage relative to the general total responding) and adjusted frequency (percentage relative to the general total minus missing specific cases).

Descriptors: Teacher Effectiveness, Science Teachers, Teacher Characteristics, Curriculum, Factors in the Teaching of Science

Accession Number: SC 052

Proceedings of the Symposium on the Effects on Technology of a Vanishing Species: Mathematics and Science Teachers. Albany, NY: State University of New York, 1982.

Availability:

Order Number: ED 221 356

State University of New York, Albany
School of Education
1400 Washington, Ave.
Albany, NY 12222

Abstract:

The symposium whose proceedings are included in this document were designed to inform diverse segments of society of the catastrophic decline in the supply of mathematics ad science teachers. It was also seen as a first step in a continuing dialogue among educators, legislators, and corporate executives in New York State. The symposium was, thus, structured as a "lighthouse" endeavor focusing on sensitizing the non-education community, in particular, high-technology industry, to a situation which will have enormous, deleterious effects on their ability to expand, to modernize, and to reap the rewards of technological advancement. Issues/topics discussed include: (1) myths about the mathematics/science teacher shortage (pay teachers more and shortages will disappear, retraining is the answer, talented people will be unaffected by inadequate/inappropriate instruction in foundation courses of science and mathematics); (2) data on the extent of the shortage; and (3) Regent's initiatives, including a proposal of a joint business/industry/education effort to enable capable high school students to enroll in collegiate programs preparing them for teaching in elementary/secondary schools for three years and then to enter positions in business and industry. Twenty recommendations from three working groups are also reported. (Author/ERIC Abstract)

Descriptors: Mathematics Education, Mathematics Teachers, School Business Relationship, Science Education, Science Teachers, Teacher Shortage

Accession Number: SC 073

Recommended Standards for the Preparation and Certification of Teachers of Science at the Elementary and Middle/Junior High School Levels. Washington, D.C.: National Science Teachers Association, 1982.

Availability:

Order Number: ED 219 253

National Science Teachers Assocation
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

This document highlights areas of concern and proposes selected standards which, if implemented, could result in improved teacher preparation in the sciences and, ultimately, in improved learning experiences for children. These standards are intended to provide guidelines to institutions and agencies desiring to achieve minimal levels of quality in science preparation programs for preservice teachers of science for the elementary and middle/junior high school levels. Standards for the science preparation for preservice elementary teachers focus on the following areas of concern: science content preparation, science content courses for elementary teachers, science teaching methods, content of the science teaching methods course, field experiences in science, faculty preparation, facilities, equipment and materials, and professional orientation. Standards for the science preparation for middle/junior high school science teacher preparation focus on the following areas of concern: middle/junior high school teacher certification, science content preparation, support content preparation, science teaching methods preparation, classroom observation/participation, student teaching/internship, college/university science and science teaching methods faculty, instructional setting/materials, library holdings (at the college level), and professional orientation. (ERIC Abstract)

Descriptors: Elementary School Science, Preservice Teacher Education, Science Teachers, Secondary School Science, Teacher Certification, Teacher Qualifications

Accession Number: SC 069

Renner, John W.; and Others. Priorities for Research in Science Education: A Survey. Norman, OK: University of Oklahoma, 1981.

Availability:

Order Number: ED 207 855

University of Oklahoma
660 Parrington Oval
Norman, OK 73019

Abstract:

Members of the National Association for Research in Science Teaching (NARST) were asked to list specific priorities for research in science education. A total of 101 members, approximately 13 percent of the NARST membership, responded with a total of 398 statements placed into one of six general research categories: (1) Teacher Education, (2) Science Curriculum, (3) The Learner, (4) Classroom Variables, (5) The Teacher, and (6) Research Methodology and Focus. In addition, responses were placed into distinct classes within each general category. The following list of 12 research suggestions (in order of priority) represents a framework from which research possibilities for dissertations and proposals could be drawn: (1) Learning Strategies, (2) Learning and Development Not Related to Piagetian Model, (3) Student Attitudes and Values Concerning Science, (4) Learning and Development According to Piagetian Model, (5) Identification of Content (Concepts and Processes), (6) Goals of Science Education, (7) Placement and Sequence of Content, (8) Content of Teacher Education Programs in Science and Education, (9) Unified or Integrated Curriculum, (10) Students' Inherent and Cultural Characteristics, (11) Implementation of Research, and (12) Instructional Materials and Technology. (Author/ERIC Abstract)

Descriptors: Needs Assessment, Research Needs, Science Curriculum, Science Education, Science Instruction, Surveys, Science Education Research

Accession Number: SC 136 J

Riley, Joseph P. "The Effects of Preservice Teacher's Cognitive Questioning Level and Redirecting on Student Science Achievement". Journal of Research in Science Teaching 18, 4 (JUL 81): 303-309.

Availability:

Order Number: EJ 249 136

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

The objectives of this experimental study were to investigate the effects of 100% high cognitive questions, 50% high cognitive questions and 0% high cognitive questions on primary and intermediate students' achievement at the knowledge, comprehension, and analysis levels. A second purpose was to examine the effects of redirecting questions on student achievement. Groups of five subjects were randomly selected from 16 intermediate and 16 primary classrooms and then randomly assigned to one of three treatment levels. Data were collected on 154 subjects. Within the three cognitive questioning treatment levels the subjects were also randomly assigned to one of two questioning strategies: (1) redirected and (2) directed. Redirection occurs when the teacher asks the same question to a number of students (in this case 2). Thirty preservice teachers conducted the treatments. The teachers were trained to follow a prescribed behavior pattern and were video taped during the treatment to insure fidelity to the scripted questions. At the end of the lesson a criterion test was administered with 3 subtests measuring at the knowledge, comprehension, and analysis levels of Bloom's Taxonomy. There was no significant difference due to redirecting questions ($p=0.05$). Students assigned to teachers using redirection scored significantly higher than those assigned to teachers not using this strategy. This difference was found on the knowledge subtest. Significant interactions occurred between questioning level and questioning strategy on the comprehension and total test. (Author Abstract)

Descriptors: Teacher Behavior, Questions, Science Education, Student Achievement, Teacher Improvement

Accession Number: SC 056

Roadrangka, Vantipa; and Yeany, Russell H. A Study of the Relationship Among Type and Quality of Implementation of Science Teaching Strategy, Student Formal Reasoning Ability, and Student Engagement. Athens, GA: University of Georgia, 1982.

Availability:

University of Georgia
Athens, GA 30602

Order Number:

Abstract:

To determine which types and qualities of science teaching strategies stimulate students to become involved in learning, middle and high school students (N=47) were observed for time on-task (time actively spent by the student in learning) and off-task while being taught by five different teachers. The "Teaching Strategies Observation Differential" (TSOD), rating teacher style on a scale from expository/direct to inductive/indirect, was used to measure verbal and non-verbal classroom activities. The quality of implementing strategies (lecture, direction, questioning, demonstration, investigation, response, or teacher guidance) identified by the TSOD was measured by a quality scale (included in the appendix). In addition, the "Test of Logical Thinking" (TOLT) was administered to determine possible relationships between developmental level and time-on-task. Results indicated that both teaching strategy type and the quality of implementing that strategy have an influence on student time-on-task, suggesting that teacher education programs emphasize both a repertoire of strategies and the qualify of implementing each type. Also, a relationship between formal reasoning ability and time-on-task pointed to teacher education programs' need for emphasizing cognitive development theory and applications of this theory to instruction to facilitate learning. (ERIC/Author Abstract Modified)

Descriptors: Classroom Observation Techniques, Cognitive Development, Developmental Stages, Science Education, Science Instruction, Secondary Education, Secondary School Science, Secondary School Students, Student Behavior, Student Teachers, Teacher Behavior, Teaching Methods, Time-on-Task

Accession Number: SC 114

Robinson, James J., ed. Research in Science Education: New Questions, New Directions. Louisville, CO: Center for Educational Research and Evaluation, 1981.

Availability:

Order Number: ED 209 075

Center for Educational Research
and Evaluation
833 W. South Boulder Road
Louisville, CO 80027

Abstract:

Presented is a compilation of papers focusing on new questions and new directions for research in science education. Papers are grouped into one of three related fields of research: (1) analysis of curriculum materials, especially science textbooks; (2) investigations of science understandings of students and experts; and (3) investigations of the contextual factors of science classrooms. A general introduction precedes each of these three sections and summarizes and compares papers. Individual papers describe a particular problem related to one of the general areas, the theoretical base underlying the research and how the problem is being investigated, and selected research findings. Topics include: (1) textbook assessment; (2) analysis of science textbooks; (3) structure, strategies, and comprehension in learning; (4) concept of change in scientific reasoning; (5) understanding and problem-solving in physics; (6) implications of classroom research for science and math instruction; (7) mathematics classroom inquiry; and (8) the case for the participant/observer in mathematics classrooms.

Descriptors: Classroom Research, Learning, Science Curriculum, Science Education, Science Instruction, Textbook Research

Accession Number: SC 176

"The Role of the Laboratory in Science Teaching". ERIC Fact Sheet, 4 (1981).

Availability:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
1200 Chambers Road
Columbus, OH 43215

Order Number:

Abstract:

The fact sheet reviews the current view of laboratories in science from differing points of view. Identified are five groups of objectives achieved through the use of laboratories in science classes: (1) skills of manipulation, inquiry, investigation, organization, and communication; (2) concepts, including those of hypothesis, theoretical models, taxonomy; (3) cognitive abilities, including critical thinking, problem solving, application, decision-making, and creativity; (4) understanding the nature of science; and (5) positive attitudes toward science. Critics of laboratories are stated as highlighting the expense of the difficulty of achieving good laboratory use for science. Reviews of research on the laboratory's role in science are examined, and existing problems concerning its use are explained.

Descriptors: Science Laboratories, Laboratory Research, ERIC Research, Science Education, Science Curriculum

Accession Number: SC 116

Roth, Robert. Review of Research Related to Environmental Education (1973-76). Columbus, OH: ERIC Center for Science, Mathematics, and Environmental Education, 1976.

Availability:

Order Number: ED 135 647

ERIC Center for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

Included in this publication are reviews of research related to: (1) concepts and programs; (2) curriculum and programs; (3) simulations, gaming, and modeling; (4) attitudes; (5) evaluation; (6) teacher attitudes; (7) teacher education; (8) camp programs; (9) administration; (10) facilities and sites; (11) environmental communications; and (12) recommendations. Past and current research is identified, summarized, and analyzed. In addition, areas in need of research and possible research designs are discussed. (ERIC Abstract)

Descriptors: Elementary Secondary Education, Environmental Education, Higher Education, Research Reviews (Publications)

Accession Number: SC 022

Rowe, Mary Budd, ed. What Research Says to the Science Teacher, Volume 1. Washington, D.C.: National Science Teachers Association, 1978.

Availability:

Order Number: ED 148 628

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

This collection of papers seeks to update practicing science teachers on science education research, to identify practical classroom application ideas, and to inform science teachers of needed research. It also addresses the need to show how science education can be extremely relevant to today's world, even in a back to basics curriculum. One such paper correlates science learning to gains in language and reading. On another level, the relationship between student achievement and teachers' questioning strategies is examined to show that teaching students productive questioning techniques is highly useful and worthy of further research. Another study asks how can a learning environment be created which accommodates all the different personality traits and learning aptitudes. A study relating student feelings and attitudes toward science to performance in the field is followed by one which assesses learning in costly science laboratories and possible alternatives. Finally, the true merits of field trips and experiential learning are questioned. (ERIC Abstract Modified)

Descriptors: Curriculum, Educational Research, Field Trips, Inquiry, Instruction, Research, Research Reviews (Publications), Science Education, Science Teachers, Scientific Attitudes, Scientific Research

Accession Number: SC 023

Rowe, Mary Budd, ed. What Research Says to the Science Teacher, Volume 2. Washington, D.C.: National Science Teachers Association, 1979.

Availability:

Order Number: ED 166 057

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

This collection of six papers represents science education's research in science teacher concern areas, often challenging favored conceptions and practices. A study of evaluation, testing, grading, and accountability issues asks why physics and chemistry teachers grade so harshly compared to other teachers, even mathematics teachers. In another study, the possibility of mathematics and science being integrated is proposed as highly potential contributors to each other for better and more interesting learning. Field trips are criticized as being possibly non-cost-effective learning tools. The focus of science learning is examined as being divided among content, methodology, and philosophy with recommendations pointing to emphasize all three. A study of how best to educate handicapped children in the sciences suggests that early exposure may be especially helpful in both exploratory skills and language development. Finally, new and future directions in computers and their increasing availability and applicability to school settings are reviewed.

Descriptors: Computer Assisted Instruction, Disabilities, Educational Research, Elementary School Science, Elementary Secondary Education, Evaluation, Field Trips, Grading, Instruction, Learning, Mathematics Education, Science Education, Secondary School Science

Accession Number: SC 191 J

Rubba, Peter A. "A Survey of Illinois Secondary School Science Teacher Needs". Science Education 65, 3 (JUL 81): 271-276.

Availability:

Order Number: EJ 249 173

John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

This is a research report of a needs assessment conducted with a statewide sample of Illinois secondary school science teachers. Instrument of testing was the Moore Assessment Profile (MAP), developed and used in an earlier parallel assessment (Moore, 1977). Some of the needs perceived by science teachers as important were: the development in students of creative thinking, development of better science reasoning skills, effective habits of science learning and studying, comprehension of the interrelationships existing between science and everyday life, understanding of behavior in emotionally handicapped students, motivating students through greater understanding of student needs, making science meaningful to students. Findings indicated a pool of commonly-perceived needs for most science teachers, but also revealed distinctly separate perceived needs in terms of the science discipline taught and perhaps in terms of the geographic region in which science was taught.

Descriptors: Assessment, Science Teacher, Science Curriculum Evaluation, Science Program Assessment, Teacher Needs in Science, Affective Education for Science Teachers

Accession Number: SC 080

Sacks, Arthur; Burrus-Bammel, Lei Lane; Davis, Craig B.; and Iozzi, Louis A. eds. Current Issues VI: The Yearbook of Environmental Education and Environmental Studies. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1980.

Availability:

ERIC Clearinghouse for Science, Mathematics
and Environmental Education
The Ohio State University
1200 Chambers Road, 3rd Floor
Columbus, OH 43212

Order Number:

Abstract:

This selection of papers from the Ninth Annual Conference of the National Association for Environmental Education (May 1980) provides both environmental education applications--the practitioner's perspective--and the results of scholarly analysis and integration--the researcher's perspective. In the first category, are papers on built environment education, a diversified forest service-USDA program, environmental education for decisionmakers in rural Vermont, the relationship between environmental and humanistic education, Project EASE (Environmental Approaches to Special Education), California rivers as vechicles for presenting the roles of environmental professionals to undergraduates, literature and film in environmental education, evaluation of a field trip series; and the Ohio State-Youth Conservation Corps Experience. In the second category, are papers about energy and transportation including views from the Congress, and a special look at the Morgantown (WV) personal rapid transit system, papers on environmental education and citizen action, with focuses on teachers' abilities to teach citizen action skills, curriculum planning and development, and paradigms for responsibility; and papers on land use and environmental health. Also included in the category on research are papers on attitudes, values, jdugments, and awareness, and those on assessing environmental education teachers and curricula.

Descriptors: Environmental Education; Environmental Research; Forestry; Community Education; Citizen Participation; Curriculum Development; Energy Conservation; Conservation Education

Accession Number: SC 105

Schmidt, W.H. The High-School Curriculum: It Does Make a Difference (Occasional Paper No. 47). East Lansing, MI: Institute for Research on Teaching, 1981.

Availability:

Order Number:

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Abstract:

This paper examines the issue of whether variability in the quantity of schooling students receive in different curricular areas is a contributor to observed differences in achievement not only among students attending different high schools, but among students in the same high school. A conceptual framework is posited articulating the determinants of achievement, including school and community characteristics, student background, and quantity of schooling in a specific curricular area. Six areas of the curriculum are examined: mathematics, English, foreign language, fine arts, social studies, and science. The sample used in the paper was 9,195 high school seniors in 725 schools taken from a nationally representative probability sample of high school seniors (National Longitudinal Study of the High School Class of 1972). The results suggest, in general, that quantity of schooling has a positive effect on academic achievement. It would further appear that the more the achievement is school-related, the larger the resulting effect that the quantity of schooling has. This was especially true for mathematics. Also in areas of achievement such as science and English, positive effects were found for the quantity of schooling in the corresponding area. In those areas of achievement such as vocabulary and reading comprehension, that seem more likely to be influenced by non-school factors, there were less clear results, but quantity of schooling did continue to have a positive effect on achievement. The fact that the multiple R^2's for these analyses were less than those for mathematics, science, and English, indicates that these areas were most likely influenced by factors and events ouside of school. (Author Abstract)

Descriptors: Academic Achievement, Research, Time, Mathematics, Science, Survey Research

Accession Number: SC 020

Science Achievement in the Schools. Denver, CO: National Assessment of Educational Progress, 1978.

Availability:

National Assessment of Educational Progress
Suite 700, 1860 Lincoln Street
Denver, CO 80295

Order Number:

Abstract:

This National Assessment of Educational Progress (NAEP) report focuses on results from three survey questionnaire assessments of the science achievements of approximately 72,000 students ages 9, 13 and 17, during the years 1969-70, 1972-73, and 1976-77. Sample questions illustrate the three major areas tested: content, process, and science and society. The results of science items at each grade level are summarized, showing what the percentage of students at each age level know and can do. Exhibits help to show results as defined by groups or specific populations of students, including the categories of age, race, sex, grade level, region, percentage white composition in school, type and size of community, level of parental education, and types of reading matter in the homes. A brief commentary looks to the implications of results with regard to students' readiness for an increasingly technical and scientific world. Appendices further detail assessments, with regard to populations, differences in age groups on identical questions, and differences by taxonomic and content area. Participating science consultants are acknowledged.

Descriptors: Scientific Literacy, Sciences, Comprehension, Formative Evaluation, Change, Comparative Analysis

Accession Number: SC 101

Science Education: Accomplishments and Needs. Washington, D.C.: National Science Teachers Association, 1978.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number: ED 171 571

Abstract:

This working paper was developed by a National Science Teachers Association committee to look at science education in the 1980's. Such a look at science education is presented with the emphasis that many sociological forces are experting influences on the classroom. Science teaching aims are explored with general principles raised from the past, compared to aims that might be appropriate for the eighties, contrasted to the need for individualization, and underscored as needing continuous revision and reassessment. Sources of satisfaction and hope in present science teaching situations are identified in new curricula and inservice education. Population trends, funding declines, declines of science in the curriculum, accountability procedural problems, changes in science students, and unionization are discussed as areas for concern. Recommendations look to curriculum development at the elementary, secondary, 2-year community college, 4-year college, and preservice teacher education levels, evaluation and assessment, laboratory equipment and supplies, improvement of teaching (inservice and preservice teacher education, competency-based teacher education, community involvement), research in education, the encouragement of women and minorities in the sciences, and further federal funding. References are provided, and appendices outline contributors and provide "The Teacher is the Key", a report on three studies by the National Science Foundation.

Descriptors: Science Education, Science Teachers, Inservice Teacher Education, Curriculum Development, Educational Research, Sociocultural Patterns

Accession Number: SC 042

Science Education for You? Washington, D.C.: National Science Teachers Association, 1975.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

This booklet for secondary school students explores the different directions a science education career might take. A definition is developed which sees all science career people as science educators. Then a number of questions are addressed, including: What does it take to be a good science educator? How can one become qualified to be a science educator? In what field would training best suit each science career-interested pupil (e.g., elementary, junior or high school teaching, research, college teaching, curriculum specialist)? What can be done while in high school to begin preparing to be a science educator? and What is rewarding about being a science educator? A science education game board takes the student through some career/education options. References are provided for financial aid sources, and for books on occupational aptitude and outlook, on science and scientists, and on higher education possibilities.

Descriptors: Secondary School Students, Science Careers, Career Planning, Science Interests, Career Guidance

Accession Number: SC 047 B

Simpson, Ronald D.; and Anderson, Norman D. Science, Students, and Schools. New York, NY: John Wiley & Sons, Inc., 1981.

Availability:

John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10158

Order Number:

Abstract:

This textbook, for the college student preparing to be a middle or secondary school science teacher, is guided by the belief that a democratic citizenry should be technologically, scientifically literate, that societal issues must be examined in the science curriculum, and that the repertoire of classroom skills must be wide and varied. Initial chapters examine goals and objectives, relating them to science instruction and evaluation; models for working with students and for dealing with discipline problems; and planning for science instruction and alternatives. Subsequent sections focus on laboratory facilities, activities, safety and equipment, strategies for teaching--questioning, lecture, games, demonstrations, small group, and inquiry techniques, and the whys and hows of evaluation. The development of interest, attitudes, and values are next discussed, together with individualizing science instruction, programs, and resources for science teaching, and science for exceptional students. Finally, a look at relating controversial issues to science deals with sex education, evolution, drugs and energy; and recommendations for enhancing professional growth in science teaching are outlined. Chapters include summaries, review questions, application and analysis procedures, and references. Appendices provide a bibliography of secondary school science resource books, lists of professional organizations and journals, periodicals, and major textbook publishers, and a directory of companies selling scientific equipment and supplies.

Descriptors: Textbooks, Teacher Education, Science Teachers, Science Instruction, Secondary School Science, Teaching Methods, Teaching Models, Class Organization, Classroom Techniques, Course Organization, Educational Strategies, Individual Instruction, Laboratory Procedures, Questioning Techniques, Small Group Instruction, Teaching Skills, Teaching Styles

Accession Number: SC 151 MF

Smith, Theodore, ed. Science Education for the 1980s. A Planning and Assessment Handbook for Kindergarten through Grade Twelve. Sacramento, CA: California State Department of Education, 1982.

Availability:

Order Number: ED 218 073

California State Department of Education
Sacramento, CA 95819

Abstract:

This handbook was designed for school-level planners (school site councils, principals, parent groups, and teachers) in developing, assessing, and improving K-12 science education programs. The main body of the handbook (chapter 2) describes the most important components of an effective science education program: (1) school-level plan; (2) classroom implementation; (3) staffing and staff development; and (4) program support. In addition, the elements of exemplary science education programs are described in detail. Assessment questions and examples of activities are also offered. If the school's program lacks many or most of the elements of effective science education described here, it is suggested that improvements will clearly be needed. Chapter 3 reiterates questions from chapter 2 in the form of a convenient checklist designed to be used by school-level planners conducting on-site assessment of school programs. It is assumed that the planners will be visiting science classes, talking with teachers and students, reviewing materials, and comparing what they see with the qualities of an effective program described in the handbook. The checklist serves as a record to later analyze their observations. Various resources are presented in the concluding chapter, such as California State School Resource Centers and a list of state publications. (Author/ERIC Abstract)

Descriptors: Biology, Information Dissemination, Logical Thinking, Secondary School Science, Teacher Workshops

Accession Number: SC 133 J

Smith, Walter S. "Career Education Attitudes and Practices of K-12 Science Educators". Journal of Research in Science Teaching 19, 5 (MAY 82): 367-375.

Availability:

Order Number: EJ 263 595

Wiley-Interscience
Division of John Wiley and Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

A random sample of 400 K-12 science educators who were members of the National Science Teachers Association were surveyed regarding their attitude toward and practice of career education in their science teaching. These science teachers rejected a narrowly vocational view, favoring instead a conception of career education which included self-perception, values analysis, and vocational skills objectives. The science educators affirmed the importance of career education for a student's education, asserted career education ought to be taught in their existing science courses, and expressed a willingness to do so. Fewer than one-third of the science teachers, however, reported incorporating career education at least on a weekly basis in their science lessons. The major impediment to including more career education in science teaching was seen to be their lack of knowledge of methods and materials relevant to science career education, rather than objections from students, parents, or administrators; their unwillingness; or their evaluation of career education as unimportant. Thus, in order to improve this aspect of science teaching, science teachers need more concrete information about science career education applications. (Author Abstract)

Descriptors: Survey Research, Science Teachers, Attitudes, Career Education, Science Education

Accession Number: SC 044

Smith, Walter S.; and Stroup, Kala M. Science Career Exploration for Women. Washington, D.C.: National Science Teachers Association, 1978.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

Six science career guidance modules are offered for counselors and teachers working with teenage women. Introductory material describes the different psychological and sociological barriers young women have in pursuing careers in science, and the role of teachers in career development. The first module develops ways to attract women to science careers; refers the counselor to pamphlets, books, and audio visuals about women and science careers, and women scientists; and encourages introduction of female teenagers to women-in-science role models. The second module leads the student through a science-oriented and general inventory of skills and capabilities, an ideal life scenario, and a major decision analysis. A third module paints the female socialization picture that explains how family and important others affect career choice. Two more modules focus on concrete career objectives, researching the field in making a career choice, interviewing a professional, and combining careers and personal lives. The final module explores the career and education selection process and job seeking, with diagrams of steps to take and a trial resume form. An appendix provides additional resources for teachers.

Descriptors: Womens Education, Females, Science Careers, Science Interests, Science Education, Role Conflict, Role Models, Socialization, Career Counseling, Career Guidance, Career Exploration, Career Planning, Career Choice

Accession Number: SC 075

Sousa, David A.; and Others. A Survey of Science Teaching in the Secondary Schools of New Jersey, 1981-82. New Jersey Science Supervisors Association, 1982.

Availability:

Order Number: ED 219 284

New Jersey Science Supervisors
Association
225 W. State Street
P.O. Box 2019
Trenton, NJ 08625

Abstract:

Questionnaires were sent to 382 public and non-public New Jersey secondary schools to determine the status of science teaching during 1981-82. Survey results (with 55% response) are reported for general information (staffing, certification, teaching duties, and others), supervisory personnel, subject matter organization, textbooks used, second year courses, and science electives. Highlights focus on percentage of students taking science (increase from 61.9% in 1978 to 67.0% in 1982), field trips, reimbursement for conferences/conventions, teaching load and non-teaching duties, paid laboratory assistants, staff decreases (due to teachers accepting positions in business/industry and declining enrollments), supervisor experiences, supervising teaching load, supervisor certification, supervisors and evaluation of personnel, advanced placement programs, second year courses, instructional time, double lab periods (decreasing in biology, chemistry, and physics), program and program use (decrease in use of science course improvement project materials--BSCS, Chem Study, Project Physics, PSSC Physics, and ESCP Earth Science, and increase in IPS, Modern Physics, and Modern Chemistry), and earth science, physical science, biology, chemistry, and physics textbooks used in 1969, 1974, 1978, and 1982. (ERIC Abstract)

Descriptors: Science Instruction, Science Programs, Science Supervision, Secondary School Science, State Surveys, New Jersey

Accession Number: SC 150 MF

Strickland, A.W. Secondary School Science and Logical Thinking. Bloomington, IN: Indiana University, 1980.

Availability:

Indiana University
College of Education
Bloomington, IN 47401

Order Number: ED 194 309

Abstract:

The goal of this project was to disseminate materials and information contained in two projects previously funded by the National Science Foundation. "Science Teaching and the Development of Reasoning" (Robert Karplus) and "The Cognitive Analysis Project" (John Renner) were the project materials disseminated in a two-phase effort. The first phase focused on creating sub-centers in four states (Indiana, Ohio, Kentucky, and Illinois), training the directors of these sub-centers, and directing their energies toward secondary school dissemination. Phase two dealt with the task of preparing and completing the dissemination efforts to public and private secondary school teachers in the four state area. The project provided aid to secondary school teachers in understanding the reasoning levels of secondary school science students (grades 7-12), using Piagetian stages of logical reasoning. (Author/ERIC Abstract)

Descriptors: Bilogy, Information Dissemination, Logical Thinking, Secondary School Science, Teacher Workshops

Accession Number: SC 174

"Summary of NSF Literature Review in Science Education". Information Bulletin, Spring 1983.

Availability:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, 3rd Floor
Columbus, OH 43215

Order Number:

Abstract:

This issue of the newsletter provides a summary of major findings from the science education portion of a 1955-1975 literature review by personnel from the ERIC Clearinghouse for Science, Mathematics, and Environmental Education, and from the ERIC Clearinghouse for Social Studies/Social Science Education. The purpose of this review was to (1) review, analyze, and summarize literature related to pre-college science instruction, to science teacher education, and to needs assessment efforts; and (2) identify trends and patterns in the preparation of science teachers, teaching practices, curriculum materials, and needs assessment in science education for the 20-year period. The review of which this paper is a summary, was one of three large scale studies of science education, mathematics education, and social science education sponsored by the National Science Foundation. (Author Abstract Modified)

Descriptors: Science Teachers, Science Education, Teaching Practices, Curriculum, Needs Assessment in Science, Teacher Preparation

Accession Number: SC 152 P

Strike, Kenneth A.; and Posner, George J. Understanding From a Conceptual Change Point of View. Ithaca, NY: Cornell University, 1983.

Availability:

Cornell University
Ithaca, NY 14853

Order Number:

Abstract:

The article focuses on two major characteristics needed for understanding new concepts. Assimilation is described as the first characteristic, needed for the initial assembly of an idea as an intelligible one within a metaphor or model of some previous understanding. It is used to make a conception of change clearly visible. Accommodation is specified as the second characteristic, dependent on the first for initial acceptance which ties the explicit idea to the real world. Its purpose is to make the conception of change useful to the individual. Also outlined as conditions needed for conceptual change are dissatisfaction with existing information, intelligibility, and plausibility of new information, and potential for extension of the concept learned. Two illustrations of concept change are provided and analyzed (Freud's theory of psychoanalysis, physics as a study for change) as examples for teaching target populations. Elements for teaching include five further steps for change process occurance within Assimilation and Accommodation characteristics.

Descriptors: Science Instruction, Science Teachers, Curriculum Development, Change Process, Cognitive Development, Phenomenalism, Dynamics of Change

Accession Number: SC 057

Sunal, Dennis W. Affective Measures for Science Teaching: Measures of Teacher Interest and Attitude Toward Science Teaching. A. Teaching Preference Scale. B. Semantic Differential Instrument for Science Teaching. Morgantown, WV: West Virginia University, 1975.

Availability:

Order Number: ED 184 821

West Virginia University
Department of Curriculum and Instruction
Morgantown, WV 26505

Abstract:

Presented are measures of teacher interest and attitude toward science teaching. A sheet is attached which describes how the instruments should be used and results analyzed. Part I includes a Teaching Preference Scale for predicting effective inquiry model use for self-contained classrooms in grades 1-6. Part II is a Semantic Differential Instrument for Science Teaching involving attitudes expressed toward the three concepts of (1) nature, (2) a student learning about science in school, and (3) myself teaching science in the classroom. (ERIC Abstract)

Descriptors: Attitude Measures, Interest Inventories, Measures (Individuals), Science Education, Teacher Attitudes

Accession Number: SC 056

Sunal, Dennis W. Microteaching Skills in Science Checklist: An Observational Instrument to be Used for Evaluation and Description of Science Teaching in the Elementary School. Revised Form. Morgantown, WV: West Virginia University, 1976.

Availability: Order Number: ED 184 822

West Virginia University
Department of Curriculum and Instruction
Morgantown, WV 26505

Abstract:

Presented is a 30-item observational instrument to be used for the evaluation and description of preservice or inservice science teaching in the elementary school. Sections of the instrument include (1) use of intellectual development stages, (2) performance objectives, (3) lesson planning skills, (4) instruction sequencing, (5) question asking skills, (6) learning-teaching strategies, and (7) evaluation techniques. (ERIC Abstract)

Descriptors: Classroom Observation Techniques, Elementary School Science, Evaluation, Measures (Individuals), Microteaching

Accession Number: SC 063 P

Sweitzer, Gary L. A Meta-Analysis of Research on Preservice and Inservice Science Teacher Education Practices Designed to Produce Outcomes Associated with Inquiry Strategy. Columbus, OH: Ohio State University; and Upper Arlington Schools, 1982.

Availability:

Order Number: ED 219 231

Ohio State University
Columbus, OH 43220

Abstract:

The discrepancy between educators' expectations for inquiry behavior and the actual status of such behavior (teachers feeling more comfortable teaching facts and feeling ill-prepared to guide students in inquiry learning) promoted a quantitative assessment of the existing research (reported between 1965 and 1980 in doctoral dissertations and journals) on training outcomes associated with inquiry teaching behaviors and the techniques and procedures used to obtain them. Meta-analysis accomplished this assessment and studies (N=68) were selected that had at least one outcome associated with inquiry strategy (knowledge of science processes, inquiry instructional strategy, indirect verbal behavior, accepting interpersonal behaviors, increased wait-time questioning behavior, higher cognitive level questioning, and discovery instructional strategy). Relevant variables were identified and coded into six major categories: (1) study form/design characteristics; (2) teacher/teacher trainee characteristics; (3) student characteristics; (4) treatment characteristics; (5) outcome characteristics; and (6) effect size characteristics (standardization of mean differences between treatment and control groups). Results among others indicated the teacher outcome most frequently measured was knowledge of science processes followed by indirect verbal behavior. (ERIC Abstract)

Descriptors: Inquiry, Inservice Teacher Education, Preservice Teacher Education, Science Instruction, Teaching Methods, Meta Analysis, Science Education Research

Accession Number: SC 076

Swift, J. Nathan. Wait Time and Questioning Skills of Middle School Science Teachers. Final Technical Report. Oswego, NY: State University of New York College at Oswego, 1982.

Availability:

Order Number: ED 220 276

State University of New York
College at Oswego
Oswego, NY 13126

Abstract:

This investigation focused on teachers' questioning skills and the use of wait time (length of pauses after questions). A sample of 40 experienced middle school science teachers from five suburban school districts in one central New York State county was divided into four treatment groups of 10 teachers each. One group received instruction in wait time using a newly-developed electronic feedback device that monitors the duration of teacher and student pauses. (A green light glows when the criterion of a three second pause is met.) A second group received instruction in general questioning skills. A third group received both instruction and the use of the feedback device, while the fourth group served as a comparison and received neither instruction nor the electronic device. Tape recordings of class discussions were coded and analyzed for classroom analyses of variance, and correlational relationships. The two groups using the electronic feedback device increased their wait time (although not to the three second criterion), used greater numbers of high level questions, and received more contributions from students as measured by length of answers, frequency of volunteered contributions, numbers of relevant student words, and percentages of student talk. (Author/ERIC Abstract)

Descriptors: Feedback, Questioning Techniques, Science Teachers, Science Education Research, Wait Time

Accession Number: SC 125

Tamir, Pinchas. The Role of the Laboratory in Science Teaching (Technical Report No. 10). Iowa City, IA: Science Education Center, 1976.

Availability:

Order Number: ED 135 606

Science Education Center
The University of Iowa
Iowa City, IA 52242

Abstract:

A history of the use of laboratory work in teaching science is traced from the 18th century to the present laboratory-centered curricula. Major rationales and objectives for laboratory work are presented, and different types of laboratory activities are discussed from the standpoint of learning theories and research findings. Also discussed is the use of the laboratory in various science disciplines, and the use of vicarious experiences as a substitute for laboratory work. An extensive bibliography is included. (ERIC Abstract)

Descriptors: Instruction, Laboratory Procedures, Learning Theories, Science Education, Science Laboratories, Sciences

Accession Number: SC 058

Thier, Herbert D. In-Service Training of Elementary School Science Teachers. Advancing Education Through Science-Oriented Programs. Berkeley, CA: University of California, 1975.

Availability:

Order Number: ED 182 158

Advancing Education Through Science-
Oriented Programs
University of California
Lawrence Hall of Science
Berkeley, CA 94720

Abstract:

In-service training of elementary school science teachers, the topic of the United States-Japan Joint Science Seminar held in Kyoto and Tokyo, Japan in 1975, is presented. Program innovations and their relationship to in-service education in the United States and Japan are discussed. The role of Japanese science centers and schools is included in the discussion of curriculum development and innovative changes needed for elementary science programs. (ERIC Abstract)

Descriptors: Elementary School Teachers, Inservice Teacher Education, Science Teachers

Accession Number: SC 113

Thompson, Ben, ed. Science for the Handicapped: An Annotated Bibliography. Eau Claire, WI: Science for the Handicapped Association, 1980.

Availability:

Order Number: ED 196 721

Science for the Handicapped Association
University of Wisconsin
Eau Claire, WI 54701

Abstract:

This annotated bibliography represents, for the first time, a single source of information on science education for the handicapped. The bibliography holds two lessons. One is that there are many dedicated people attempting to fill a real void in the education system. The second lesson is that much remains to be done. There are serious gaps in all phases of science education for the handicapped. (Author Abstract Modified)

Descriptors: Disabilities, Hearing Impairments, Resource Materials, Science Education, Visual Impairments, Science Education Research

Accession Number: SC 021

Three National Assessments of Science: Changes in Achievement, 1969-77. Denver, CO: National Assessment of Educational Progress, 1978.

Availability:

National Assessment of Educational Progress
Suite 700, 1860 Lincoln Street
Denver, CO 80295

Order Number:

Abstract:

The U.S. Office of Education's National Assessment of Educational Progress (NAEP) program tested levels of science achievement in 2,500 students each from 9-, 13-, and 17-year-old age groups, in 1969-70, 1972-73 and in 1976-77. They were tested on knowledge, understanding, and appreciation of fundamental aspects of science and their social relevance. Then chances in performance for the three age groups were assessed across the three time periods. Nine- and 13-year-olds reversed their decline of the first and second assessments with a levelling off in the third. Achievement levels of 17-year-olds continued to decline. Students in extreme rural communities, at each age level, have improved across the entire eight years. Whites and males remain higher achievers then blacks and females; nevertheless, black 13-year-olds improve in physical science from the second to the third assessment. Better inservice teacher education and increased compensatory education for underserved, underachieving populations are indicated. Extensive tables and graphs map out specific achievement levels for each age group, each year, and each population group.

Descriptors: Scientific Literacy, Sciences, Comprehension, Formative Evaluation, Change, Comparative Analysis

Accession Number: SC 049 P

Tobin, Kenneth G.; and Capie, William. Wait-Time and Learning in Science. AETS Outstanding Paper for 1981. Perth, Australia: Mount Lawley College; and Athens, GA: University of Georgia, 1981.

Availability:

Order Number: 221 353

Carolina Biological Supply Company
Burlington, NC 27215

Abstract:

An understanding of classroom learning requires careful analyses of variables constituting the learning environment. Among those most likely influencing learning are verbal behaviors, since verbal interaction is the principal mode of communication in most classrooms. Thus, the quality of verbal interaction may directly affect the amount of learning that occurs. Although much research on verbal interaction has dealt with aspects of teacher questioning, the results have tended to be inconsistent. In contrast, a variable called "wait-time", which is related to the duration of certain pauses between speakers, has been shown to have a consistent effect on the quality of verbal interaction that occurs in classrooms. Using the preceding as a rationale, the nature of wait-time is discussed, followed by three alternative conceptualizations (definitions) of wait-time. Results from several wait-time studies are reviewed, reporting the changes in student/teacher behavior resulting from prolonging wait-time, effects on process variables, effects on science achievement and other variables, and studies related to changing teachers' wait-time behavior. (Author/ERIC Abstract)

Descriptors: Questioning Techniques, Science Education, Science Instruction, Student Behavior, Teacher Behavior, Science Education Research, Wait Time

Accession Number: SC 006

A Tool for Assessing and Revising the Science Curriculum. Des Moines, IA: Iowa Department of Public Instruction, 1981.

Availability:

Order Number:

State of Iowa
Department of Public Instruction
Grimes State Office Building
Des Moines, IA 50319

Abstract:

This assessment and review instrument was developed by the Iowa Department of Public Instruction and the Iowa Council of Science Supervisors to be used by schools on a continuous basis. It provides a schedule for conducting such a review/assessment, with such steps as discussing science education problems and trends, placement of objectives, and providing teacher inservice of new materials. A model for helping schools develop their science philosophy, goals and objectives puts forth the overall Iowa Codes and rationales for the same. Objectives outlined include: to apply science processes as part of basic learning. to communicate knowledge of processes as part of basic learning, to communicate knowledge of natural phenomena, and to use scientific knowledge and processes in comprehending the impact of science and technology on the individual, culture, and society. Levels are recommended at which suggested objectives can be introduced, emphasized, and maintained. Finally, a scale is introduced for matching local science curriculum needs to available science programs.

Descriptors: Science Curriculum, Curriculum Evaluation, Course Objectives, Objectives, Educational Objectives, Science Instruction, Curriculum Development

Accession Number: SC 053

Tyler, Ralph W. Integrating Research, Development, Dissemination and Practice in Science Education. Stanford, CA: Center for Advanced Study in the Behavior Sciences, 1980.

Availability:

Order Number: ED 199 071

Center for Advanced Study in the
Behavior Sciences
Stanford, CA 94305

Abstract:

It is suggested that the potential contributions research and development activities can make to the improvement of educational practice are far from fully realized for a variety of reasons. Researchers overlook problems teachers consider important, teachers are skeptical of proposals from external groups, and researchers and teachers lack a mutual appreciation of their problems. It is advocated that practitioners and researchers work together, and examples are cited of gaps in research and development efforts that limit the comprehensiveness of current knowledge of the systems designed to improve science education. (Author/ERIC Abstract)

Descriptors: Educational Research, Research Needs, Research Opportunities, Research Utilization, Science Education, Research Practice Relationship

Accession Number: SC 051

Voss, Burton E. A Summary of Research in Science Education--1981. Ann Arbor, MI: University of Michigan, 1982.

Availability:

Order Number: ED 223 464

John Wiley & Sons, Inc.
605 Third Ave.
New York, NY 10016

Abstract:

The review of science education research for 1981 includes individual analyses of approximately 400 dissertation abstracts, journal articles, research reports, and papers presented at conferences. The organization of the review is topical. Topics include: (1) status studies of science education; (2) cognitive style; (3) Piagetian studies; (4) student characteristics, attitudes, and interests; (5) teaching strategies and learning; (6) teacher use of instructional materials and learning; (7) instructional technology; (8) evaluation instrumentation and methodology; (9) curriculum research; (10) teacher education; and (11) science supervision. A rationale is provided at the beginning of each section for the particular studies clustered into it. A summary is provided at the end of each section. It is noted that 1981 was the beginning of publication of many meta-analyses on specific subjects in science education. Since these studies have the potential of "clouding" the summary of findings of a particular year, most of these meta-analyses were placed in the summary of each section. (Author/ERIC Abstract)

Descriptors: Cognitive Development, Learning, Science Curriculum, Science Education, Science Instruction, Student Characteristics, Science Education Research

Accession Number: SC 155

Wall, Janet. Compendium of Standardized Science Tests. Monterey, CA: Naval Postgraduate School, 1981.

Availability:

Order Number:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

The compendium is directed at science teachers who must select testing tools appropriate to differing populations and for differing combinations of testing needs. It constitutes the collection of information on all known published standardized science tests. Included are sections of tests in Braille, science tests in large type, and item banks. It is organized by grade level (elementary, middle/junior high, and secondary school). Within each grade level classification, the tests are listed by title. Descriptors include test name, author, publish form and level, probable purpose, number of test items, administration time, content, cost, norms, reliability, validity, various skill profiles, extractable (reports), and background information summary.

Descriptors: Science Teachers, Curriculum, Achievement Profiles, Achievement Tests, Science Content, Science Instruction, Instructional Improvement, Assessment, Evaluation

Accession Number: SC 164

Weiss, Iris R; and Place, Carol, eds. Women Scientist Roster. Research Triangle Park, NC: Research Triangle Institute, 1979.

Availability:

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Order Number:

Abstract:

This roster was developed for the purpose of identifying women scientists for use as role models in programs for female students in the encouragement of their participation in science careers. The Visiting Women Scientist Program, of which the roster was originally a part, was conducted on 1978-79 by the Research Triangle Institute (RTI) of North Carolina with support from the National Science Foundation and had as its goal the increase of participation of women in science careers by (1) giving female students an opportunity to interact with women scientists; (2) providing information about career opportunities in science and technology; and (3) presenting examples of ways by which women scientists can combine a science career and personal life. Results of the project indicated that in-school visits were viewed as successful by both faculty and students. The format roster contains information about approximately 1,300 women scientists. Two testing methods are used for identification--one alphabetically ordered by state and the other alphabetically ordered by last name.

Descriptors: Science Education, Career Planning, Science Resources, Sex Equity, Women in Science

Accession Number: SC 010 J

Welch, Wayne W.; and Lawrence, Frances. "Characteristics of Male and Female Science Teachers". Journal of Research in Science Teaching 19, 7 (OCT 82): 587-594.

Availability:

Order Number: EJ 268 900

Wiley-Interscience
Division of John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10016

Abstract:

Characteristics of 273 male science teachers were compared with 72 female science teachers randomly selected from a fourteen-state region in the USA. Environmental factors that might repel women from scientific pursuits, in particular science teachers as a source of influence were concentrated upon. Interest in science, knowledge of science, receptivity to change, and teacher perceptions of themselves and their environment were investigated with the Science Attitude Inventory, the Science Process Inventory, the Welch Curriculum Attitude Survey, and a teacher questionnaire. A multivariate analysis of variance found differences between the two groups significant at the 0.0005 level. Female teachers were higher on measures of interest in science and receptivity to change. Males scored higher on science knowledge indicators and on their perceptions of the teaching support they received. No differences were noted on measures of professional development or their perceptions of teaching effectiveness, curriculum, workload, or facilities. The implications are that factors which lead to science and science teaching careers are probably different for the two sexes, and that it is not just the nature of science that attracts these teachers to the field, perhaps instead it is the inner drive of the women or men, and the role models they have that lead them to the field.

Descriptors: Science Teachers, Role Models, Sex Differences, Career Choice, Sciences, Science Interests

Accession Number: SC 090

White, Arthur L., ed. National Association for Research in Science Teaching 53rd Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1980.

Availability: Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) cooperated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 53rd annual NARST conference in Boston, Massachusetts, April 11-13, 1980. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. Samples of topics represented by these abstracts include: learning, management school programs, elementary school research, student behaviors and characteristics, curriculum development and evaluation, preservice teacher education, instrument development, achievement and learning, curriculum and instruction, and teacher education. Conference groupings of sessions and symposia are outlined in a table of contents, which provides access to the abstracts.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 089

White, Arthur L., ed. National Association for Research in Science Teaching 52nd Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1979.

Availability: Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC), together with the National Association for Research in Science Teaching (NARST), worked to provide abstracts of most of the papers presented at the 52nd annual NARST conference in Atlanta, Georgia, March 21-23, 1979. All those who had papers or symposia accepted were invited to submit abstracts for inclusion in this publication. Examples of topics from the nearly 100 abstracts presented here are perception and student behavior, teacher attitudes and characteristics, cognitive science methodologies, Piagetian research, inservice/preservice teacher education, instruction, teacher evaluation, learning, elementary science instruction, and factors affecting achievement. A table of contents outlines conference proceedings and provides access to the abstracts.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 088

White, Arthur L., ed. National Association for Research in Science Teaching 51st Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1978.

Availability: Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers, Road
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) joined with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 51st annual NARST conference in Toronto, Ontario, Canada, from March 31 to April 2, 1978. All persons who had papers or symposia accepted were invited to submit abstracts for inclusion in the publication. Some representative topic areas discussed in this collection of abstracts are cognitive development and structure, teacher education, student behavior, learning theory, general research, preservice teacher education, evaluation studies, curriculum development and evaluation, instruction, and teacher behavior. A table of contents facilitates access to the abstracts by subject, symposia, or session grouping.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 093

White, Arthur; and Blosser, Patricia, eds. National Association for Research in Science Teaching 56th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1983.

Availability:

Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse on Science, Mathematics, and Environmental Education (ERIC/SMEAC) cooperated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 56th annual conference at the Dallas Hilton, Dallas, Texas, April 5-8, 1983. All those who had papers or symposia were invited to submit abstracts for inclusion in this publication. Some of the many topics represented in this collection of abstracts are: Piagetian studies, attitudes and achievement, visual effects and learning, using language to enhance learning, instructional uses of computers, cognitive style and learning, student characteristics and instructional strategies, gender-related differences in achievement, learning science in the elementary school, parents and children learning together, social climate of the classroom, learning from out-of-school experiences, problem solving, and children's thought processes. A table of contents provides access to the abstracts with titles listed by conference groupings.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 092

White, Arthur L.; and Blosser, Patricia, eds. National Association for Research in Science Teaching 55th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1982.

Availability:

Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) joined with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 55th annual NARST conference at The Abby, Lake Geneva, Wisconsin, April 5-8, 1982. All persons who had papers or symposia were invited to submit abstracts for inclusion in this publication. Representative topics are: student characteristics, elementary teacher preparation, science instruction, museums and alternative settings, science education research, urban achievement, reasoning, process skills, creation and evolution, and curriculum. Titles are grouped by session and symposia headings for access through the table of contents.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 091

White, Arthur L.; and Novak, John, eds. National Association for Research in Science Teaching 54th Annual Meeting. Abstracts of Presented Papers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1981.

Availability:

Order Number:

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) cooperated with the National Association for Research in Science Teaching (NARST) to provide abstracts of most of the papers presented at the 54th annual NARST conference at Grossinger's in the Catskills, New York State, April 5-8, 1981. All those who had papers or symposia were invited to submit abstracts for inclusion in this publication. The approximately 100 abstracts represent papers on such topics as classroom behavior analysis, patterns of reasoning, meta analysis, building community support for science education, learning and instruction, teacher performance, curriculum analysis, sex related differences and roles, attitudes and science, teaching strategies, achievement, teacher behavior, cognitive development, teaching, laboratories, and science needs, interests and literacy surveys. A table of contents groups titles by conference sessions, symposia, and roundtables.

Descriptors: Science Instruction, Science Teachers, Science Curriculum, Science Education, Science Programs, Scientific Research, Conferences, Conference Papers, Abstracts, Teaching Methods

Accession Number: SC 149 MF

White, Arthur L.; and Others. A Study of the Research Priorities as Perceived by Elementary and Secondary School Science Personnel. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1980.

Availability: Order Number: ED 186 264

ERIC Clearinghouse for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

Abstract:

This report briefly reviews the rationale for and history of a cooperative effort of the National Association for Research in Science Teaching and the National Science Teachers Association to increase the influence of classroom science teachers on science education research and to improve teachers' perception of the relevance of science education research. Processes, initial results, and planned future activities and procedures are reported that relate to obtaining input from teachers to identify relevant research questions related to classroom practice. An analysis of data collected from questionnaires submitted to science teacher personnel (N=45) is presented that summarizes research needs of secondary and of elementary science teaching personnel. (ERIC Abstract)

Descriptors: Educational Research, Research Needs, Science Education, Science Teachers, Teacher Attitudes

Accession Number: SC 054

Wiley, Karen B.; and Race, Jeanne. Executive Summary: Social Science Education. A Literature Review and Analysis Related to Assessment of Needs and Existing Practices in U.S. Schools in Pre-College Natural Science, Mathematics, and Social Science Education. Boulder, CO: Social Science Education Consortium, Inc., 1977.

Availability: Order Number: ED 196 781

Social Science Education Consortium, Inc.
Boulder, CO 80309

Abstract:

This paper presents a general analysis of literature related to precollege social science education for the period 1955 to 1975. The study was part of a larger investigation of the literature on needs and practices in pre-college science, mathematics, and social science education. Specific objectives of the social science portion of the study were to identify, analyze, and summarize the literature concerning the state of and trends in practices in precollege social science education, the effectiveness and efficiency of educational practices, and the state of and trends in perceptions of needs. Major sources of information included the ERIC data base, "Dissertation Abstracts", "Psychological Abstracts", "Education Index", reviews of research in social studies education, and other journals related to the social sciences. The report is presented in four major sections. Section I describes the state of social studies practices and changes over the 20 year period. Section II focuses on current educational practices in social studies. Section III describes literature that surveys needs in the social studies. Section IV examines the "new social studies". One-hundred-fifteen summary observations are listed at various points throughout the paper. These include the difficulty of obtaining a clear picture of patterns of actual classroom practices, teacher education practices, and needs. Particular problems are that very little research on effectiveness exists, there is difficulty in defining purposes and boundaries of social studies, and there are many differing perceptions of the "new social studies". (Author/ERIC Abstract)

Descriptors: Educational Needs, Educational Practices, Needs Assessment, Social Studies

Accession Number: SC 175 J

Worthy, Ward. "Classroom Crisis in Science and Math". Chemical and Engineering News 60, 29 (JUL 82): 9-16.

Availability:

American Chemical Society
1155 16th Street, N.W.
Washington, D.C. 20036

Order Number: EJ 266 188

Abstract:

A review on most components--historical, current, and projective--of the science and mathematics teacher shortage is considered in this article. Points made include estimated science literacy levels, achievement tests in science results, reviews of surveys regarding information on science education, funding declines from the national level, pros and cons toward science as an educational priority, information regarding science education in the United States and in other countries, and projects currently active to promote science education in the schools. The author notes that many national social and educational organizations are now supporting science education to a degree not seen until recently. Efforts are also being undertaken to make science more attractive to more students, although many of these efforts are outside the confines of school. The author provides a detailed and comprehensive review of how science education came to its present state and where it can direct future efforts.

Descriptors: Science Education, Science Teachers, Math Teachers, Science Curriculum, Funding for Science, Trends in Science

Accession Number: SC 094 P

Yager, Robert E. Anything Over 90% is Almost All. Iowa City, IA: The University of Iowa, n.d.

Availability:

Order Number:

Science Education Center
The University of Iowa
Iowa City, IA 52242

Abstract:

Science educators must redirect their attention from being concerned about science/mathematics teacher shortages and falling behind other nations' programs to other indicators of crisis. These indicators arise from Project Synthesis, and from studies by Brandwein, by Voelker and Miller, by the National Science Foundation, and by the National Science Teachers Association. Aspects identified are that more than 90 percent of all science teachers primarily use the textbook, generally do not use direct experience as a teaching method are only preparing students for the next academic level, have a philosophical orientation toward only one specific science textbook verification. Moreover, 90 percent of all high school graduates are not scientifically/technologically literate, and are not interested in pursuing science. In addition, teachers seem to prefer static teaching goals and the comfort of knowing what a course will be prior to working with it. Scientific/technological literacy is essential for democracy. Existing science programs and teaching styles are missing the target. Current calls for action, promises of significant funding, and general support among political, educational, and industrial leaders are welcomed and needed to pull science education back on target.

Descriptors: Science Instruction, Science Teachers, Teaching Styles, Teaching Methods, Teacher Effectiveness, Teacher Improvement, Instructional Improvement

Accession Number: SC 123

Yager, Robert E. The Importance of Terminology in Teaching K-12. Iowa City, IA: Science Education Center, n.d.

Availability:

Science Education Center
The University of Iowa
Iowa City, IA 52242

Order Number:

Abstract:

Several recent reports concerning the status of science education in K-12 classrooms have emphasized the centrality of textbooks to instruction. Some initial investigations of the nature of textbooks have suggested that typically more new words and terms are introduced than one would expect to find as foreign languages are studied. This is a review of these initial studies, a review of the studies of mastery of vocabulary in foreign languages, and a review of general research concerning the vocabulary development, especially as it pertains to reading. Twenty-five of the most commonly used textbooks in K-12 science classrooms are analyzed in terms of the occurrence of special/technical words. The number of words introduced at every level is considerable--often more than would be required if a new language were being introduced. In addition, the number of new words in science often approaches the total number that could be expected in terms of total vocabulary increase at a given grade level for a given student. There is strong evidence that one major facet of the current crisis in science education is the considerable emphasis upon words/terms/definitions as the primary ingredient of science--at least the science that a typical student encounters and that he/she is expected to master. (Author Abstract)

Descriptors: Science Education, Textbooks, Vocabulary, Research, Literature Review, Learning Outcomes

Accession Number: SC 013 J

Yager, Robert E. "Science Education". ASCD Curriculum Update, (SEP 81) (Entire Issue)

Availability:

Order Number:

Research Information Service
Association for Supervision and Curriculum Development
225 North Washington Street
Alexandria, VA 22314

Abstract:

The National Science Teachers Association (NSTA) along with several other organizations has helped develop new goals and curriculum for K-12 science education, under the heading "Project Synthesis". This project looks to a 1980's science program that will utilize the human being, human potential, human advances, and human adaptation as well as current problems and issues as organizers. Alternative futures will be a desirable focus together with processes that can be used by the learner generally in our society. In the past too much influence has been placed on text book learning. Practice with decision-making skills that use scientific knowledge in a social context and the discovery of information in itself as a goal will be emphasized. Career awareness and moral, ethical, and value considerations will come into play as integral to a rounded science education. Overall, new science directions should look to the human as a central ingredient, to local, community, and societal relevance, to use of the natural environment, and to applied rather than discipline-bound science. For example, nutrition and energy-based experimentation and education can and should take the forefront in today's world. Some new curriculum efforts are outlined, and notes are appended to the article.

Descriptors: Science Instruction, Curriculum Enrichment, Instructional Innovation, Student Centered Curriculum, Relevance (Education), Sciences, Ethical Instruction, Creative Development

Accession Number: SC 025

Yager, Robert E., ed. What Research Says to the Science Teacher, Volume 4. Washington, D.C.: National Science Teachers Association, 1982.

Availability:

Order Number: ED 225 817

National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Abstract:

This volume was conceived as a review of basic research in science education and as a discussion of what the research findings mean for K-12 science teachers. The eight reports provide reviews of a given dimension and/or a goal of science teaching and suggests ways that current knowledge might affect practice. Reports focus on: (1) a review of some major studies in instruction, with suggestions for applications to science/mathematics curricula (J. Stallings); (2) information processing psychology and a brief description of a science project using its methodology (J. Larkin); (3) role of instruction in the development of problem-solving skills in science (R. Ronning and D. McCurdy); (4) developing creativity as a result of science instruction (J. Penick); (5) deriving classroom applications from Piaget's model of intellectual development (D. Phillips); (6) the development of an attentive public for science: implications for science teaching (A. Voelker); (7) factors affecting minority participation and success in science (J. Kahle); and (8) status of graduate science education: implications for science teachers (J. Gallagher and R. Yager). Brief summaries of each report and background information are provided in an introduction. A list of six actions by educators that would serve to implement the research findings and set new directions for science education is presented in an epilogue. (ERIC/Author Abstract Modified)

Descriptors: Cognitive Development, Cognitive Processes, Creativity, Decision Making, Elementary School Science, Elementary Secondary Education, Graduate Study, Mathematics Instruction, Minority Groups, Problem Solving, Science Curriculum, Science Education, Science Instruction, Secondary School Science, Social Problems, Technology, Science and Society, Science Education Research

Accession Number: SC 154

Yager, Robert E; and Bonnstetter, Ronald J. Changing Views in School Science. Iowa City, IA: University of Iowa, 1983.

Availability:

University of Iowa
Science Education Center
Iowa City, IA 52242

Order Number:

Abstract:

The article offers a brief comparison of sample views held with regard to (1) science classes content, and (2) science teachers by sample groups of individuals aged 9, 13, 17, and young adults (ages 26-35 and actively employed). The sample structured within 11 categories indicated that the number of students who report science as fun decreases through school years and young adulthood, that school science is perceived more positively for students enrolled than for young adults recalling school experience, that students perceive teachers as making science less exciting the longer students stay in school, that students generally report science study as useful. The authors state the hope that new directions for school science will be designed to correct these and other problems. The sample included 2,500 people and was conducted in a 1977 assessment in science, with a follow-up sample of 700 persons in 1982 within five Iowa area education agencies. It was the Third Assessment of Science, which was part of the National Assessment of Educational Progress.

Descriptors: Science Instruction, Science Teachers, Affective Science Education, Curriculum, Student Attitudes, Adult Attitudes (Science), Instructional Improvement

Accession Number: SC 070 P

Yeany, Russell H.; and Others. Using Behavior Analysis to Train Better Science Teachers: A Review of Research and Practice. Athens, GA: University of Georgia, 1982.

Availability:

Order Number: ED 215 895

University of Georgia
Athens, GA 30602

Abstract:

Strategy analysis systems (SAS) used to describe classroom instruction are characterized by three components: (1) observing classroom behavior, (2) coding behavior into categories, and (3) data reduction with translation into meaningful feedback. Unique learning environments (laboratories and inquiry teaching) have necessitated developing SAS unique to science. Although these instruments have elements in common, they differ on various conceptual and contextual dimensions. SAS include: (1) categorical-linear, such as behavior checklists, which use nominal or continuous data to determine the frequency of specific instructional behaviors but not the relative change along a given continuum; (2) descriptive, designed to record and measure observed behavior without assessing the quality of what is being observed; (3) evaluative, designed to assess type and quality of teaching behaviors; (4) specialized, developed to measure specific teaching strategies and processes; and (5) general, designed to measure generic teaching behaviors. Although designed for research purposes, SAS are also used in teacher education, including training in use of instruments, analyzing teaching models, practicing teaching skills (microteaching), analyzing lessons (self, peer, supervisor analysis), and in reteaching. Research results indicate the efficiency of strategy analysis employed in assessing classroom behavior and as a means for training preservice teachers in using these behaviors. (Author/ERIC Abstract)

Descriptors: Classroom Observation Techniques, Measures (Individuals), Science Instruction, Teacher Behavior, Training Methods, Behavior Analysis, Science Education Research

Accession Number: SC 064 P

Yeany, Russell H.; and Porter, Charles F. The Effects of Strategy Analysis on Science Teacher Behaviors: A Meta-Analysis. Athens, GA: University of Georgia, 1982.

Availability:

Order Number: ED 216 858

University of Georgia
Athens, GA 30602

Abstract:

Meta-Analysis procedures were employed to integrate existing science education research findings on the effectiveness of teacher strategy analysis training to: (1) determine overall magnitude of effect that can be expected from such training; (2) determine and compare relative magnitude of effects attributable to various approaches to such training (for example, self-analysis versus analysis of models, or microteaching versus no microteaching); (3) examine the relationship between the effect and the school level of the teacher (elementary, middle, or high school); (4) compare the effects when measured directly by recording teacher behaviors versus more indirectly when measuring student behaviors; and (5) calculate the effects assessed through behavioral versus cognitive or affective outcomes. Studies selected included those with sufficient statistical data to derive an effect size for treatment in the study (difference between baseline mean and treatment group mean in units equal to standard deviation of baseline data). Results indicated: (1) teaching strategy analysis is an effective training procedure; (2) all procedures presented had a positive impact on teachers' behavior, especially the use of models and providing systematic feedback (method of choice); and (3) positive effect sizes in cognitive and affective areas and across educational levels. (Author/ERIC Abstract)

Descriptors: Classroom Observation Techniques, Science Teachers, Teacher Behavior, Training Methods, Meta Analysis, Science Education Research

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